OCTOBER

DENTAL LIBRARY

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

Maxillary Cysts—*Meyer*
Leukoplakia—*Bettman*
Callahan Method—*Johnston*
Diet and Dental Periclasia—*Bryan*
Carcinoma of Mouth—*Kronfeld*
Oral Surgery—*Thomas*
Recording of Periodontal Disease—*Hirschfeld*
Tissue Disturbances from Separation of Teeth—*Urban, Beisler and Skillen*
Duty of Periodontist—*Dixon*
Orthodontia and Periodontal Disease—*Hoffman*
Public and Professions—*Davis*
Orthodontic Treatment—*Ketcham*

EDITORIALS
Panel Dentistry—Pyorrhea Alveolaris
COUNCIL ON DENTAL THERAPEUTICS
Accepted Dental Remedies—Plastic Materials
BUREAU OF CHEMISTRY
Dr. Hubbel's Formula
DENTAL HEALTH EDUCATION
Educational Program—*Davis*
Iowa Plan—*Gardner*

CONTENTS

Board of Trustees, American Dental Association....Frontispiece

ORIGINAL COMMUNICATIONS

Median Anterior Maxillary Cysts.
By A. W. Meyer....1851

Significance of Leukoplakia.
By M. Monte Bettman, D.M.D....1877

The Callahan Method of Root Filling.
By Harry B. Johnston, D.D.S....1883

Is the Matter of Diet Emphasized Sufficiently to Dental Periclasia Patients?
By A. W. Bryan, D.D.S., F.A.C.D....1893

Histopathology of Carcinoma of the Mouth.
By Rudolf Kronfeld, M.D....1900

Fundamentals Underlying the Practical Management of: Various Oral Surgery Conditions; Roentgenographic Interpretation and Mouth Diagnosis from a Health Standpoint.
By Earle H. Thomas, M.D., D.D.S., LL.B., F.A.C.D....1916

Diagrammatic Recording of Periodontal Disease.
By Isador Hirschfeld, D.D.S....1927

Tissue Disturbances Caused by Mechanical Separation of the Teeth of the Dog.
By L. B. Urban, B.S., D.D.S., E. H. Beisler and William G. Skillen, D.D.S....1943

The Duty of the Periodontist to His Patients.
By Maxwell Merton Dixon, D.D.S....1954

Influence of Orthodontia on the Treatment and Prevention of Periodontal Disease.
By Henry F. Hoffman, D.D.S....1963

Partnership Between the Public and the Professions.
By Michael M. Davis....1971

Indications for Orthodontic Treatment in Periodontal Cases.
By Albert H. Ketcham, D.D.S., F.A.C.D....1980

Results of the Survey Conducted by the Guild Research Bureau for Ritter Dental Manufacturing Company, Inc....1990

EDITORIAL DEPARTMENT

A New Light on Panel Dentistry in America. — An Encouraging Sign of the Times. — The Question of Pyorrhea Alveolaris. — An Agreement Between the American Dental Trade Association and the American Dental Association.—Dallas Elmer Hardenbrook (1887-1931). — Theodore Victor Smith (1879-1931). — Charles Edgar Post (1860-1931). — Death of Mrs. Henshaw....1997-2008

COUNCIL ON DENTAL THERAPEUTICS

Accepted Dental Remedies....2009

Report on Plastic Materials....2012

BUREAU OF CHEMISTRY

Dr. Hubbel's Formula....2014

BUREAU OF DENTAL HEALTH EDUCATION

Educational Program on Dentistry for Children in Michigan.
By William R. Davis, D.D.S....2016

The Iowa Plan for Dental Health Education.
By Thomas A. Gardner, B.A., D.D.S....2019

CURRENT LITERATURE

Extracts and Abstracts....2027

MISCELLANY

Book Reviews....2030

Announcements....2032

LIBRARY BUREAU

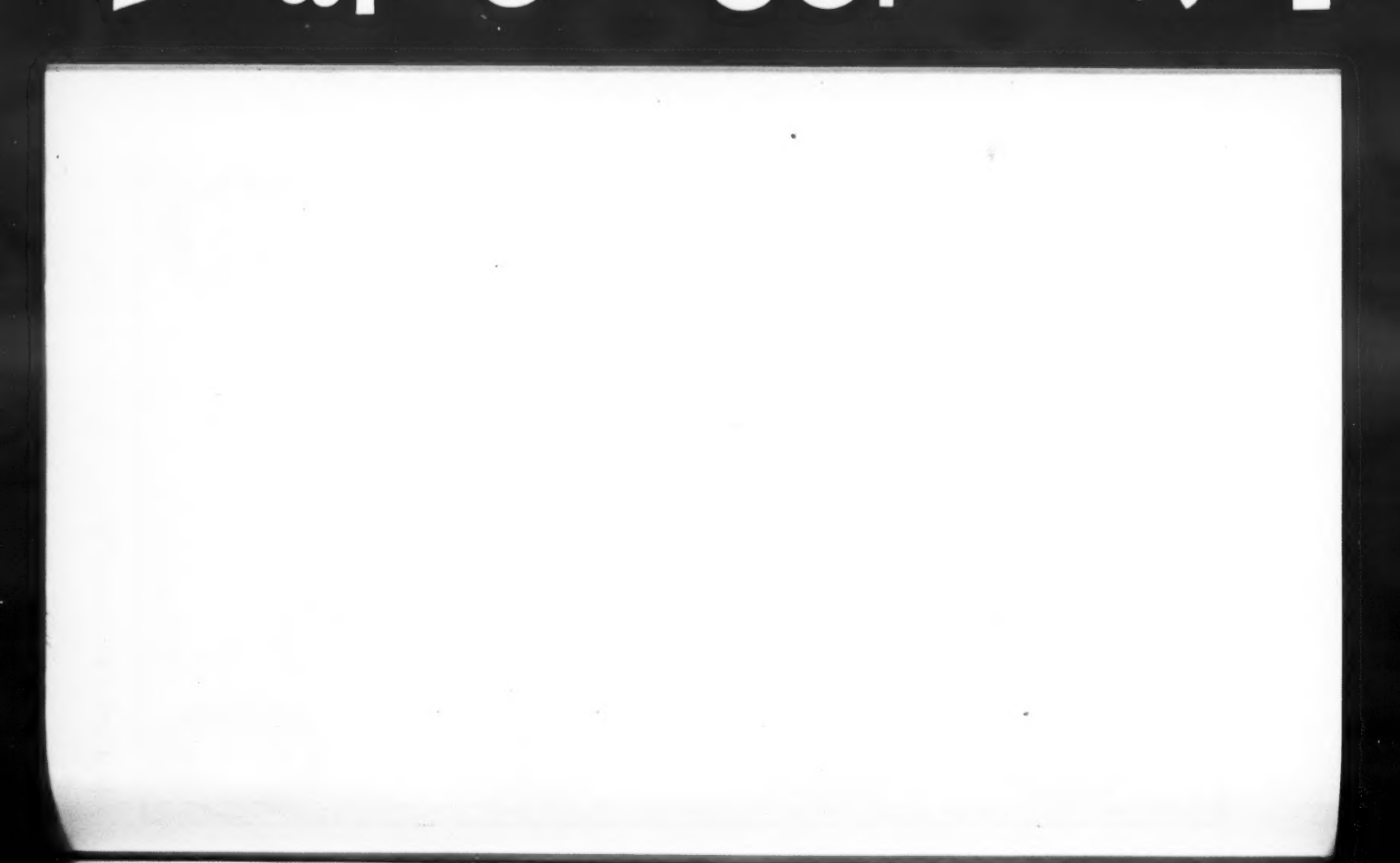
Recent Books Worth Borrowing or Buying....2040

ADVERTISEMENTS

Index to Advertisements....A-57

Classified Section....A-51, A-52

The Journal of the American Dental Association, Vol. XVIII, No. 10. Published by the American Dental Association, 212 East Superior Street, Chicago, Ill. Yearly subscription, $2.50. Entered as second-class matter, May 1, 1928, at the postoffice at Chicago, Ill., under the act of Aug. 24, 1912. Published monthly.



BOARD OF TRUSTEES
AMERICAN DENTAL ASSOCIATION, 1930-1931

THE JOURNAL
of the AMERICAN DENTAL ASSOCIATION

VOL. 18 OCTOBER, 1931 No. 10

Original Communications

MEDIAN ANTERIOR MAXILLARY CYSTS*

By A. W. MEYER, Palo Alto, Calif.

IN 1914, I reported[1] finding a large cyst in the median plane of a maxilla in a dissecting room cadaver. A similar cyst had been noticed by me at the University of Minnesota in 1908. Congdon[2] (1920) reported another specimen from this laboratory. All of these cysts were found in cadavers past middle age, in the course of dissection, and were noticed because we make median sagittal sections of all bodies dissected.

The origin of the cavity that I reported in 1914 was open to some doubt because, as stated at the time, one of the incisor teeth was not sound. There was no apparent evidence of infection at its root, which was separated by a thin layer of bone from the wall of the cyst. The teeth were sound in the case reported by Congdon, who stated that the inner layer of the cyst was formed by columnar epithelium. The presence of such an epithelial lining alone would rule out a cavity produced by an abscess, although a cavity of epithelial origin could, to be sure, become infected and lose or retain its epithelial lining.

I suggested that the cavity which I had described might be an aberrant supernumerary paranasal sinus, although its spatial relations to the incisive canals were self-evident, and such an origin was first considered. Since the preservation of the body in which this cavity was found was poor, a histologic examination of the thin, easily detached lining was not made. Moreover, it is possible that an epithelial lining in a cyst might completely degenerate or be destroyed en-

*From the Department of Anatomy, Stanford University.

1. Meyer, A. W.: Unique Supernumerary Paranasal Sinus Directly Above Superior Incisors. Spolia Anatomica, J. Anat. & Physiol., 48, 1914.

2. Congdon, E. D.: Supernumerary Paranasal Sinus, Anat. Rec., 19, 1920.

tirely in consequence of secondary infection. Because of the lack of adequate embryologic knowledge on the development of the nasopalatine region, the occurrence of nasopalatine diverticula and the nearly median position of the cavity, I excluded its origin from the so-called incisive ducts at that time.

position, and they ranged in size from 4 to 24 mm. All were closed and had a thin lining which was quite easily detached from the surrounding bone. The latter did not bulge over any of these cysts, although none were empty. The three smaller ones contained some soft, friable coagulum; one contained a semi-

Fig. 1.—Two small superimposed median maxillary cysts a little to right of midline, in left major anterior palatine canal.

Since the second similar instance reported by Congdon, we have found seven more cavities in six other bodies. All of these cavities were roughly spherical in shape; some were slightly eccentric in

fluid, viscous, glairy material, which very clearly was not pus, and two contained a firm amber-colored mass which completely filled the cyst. Some of these cysts are represented in median section in

Figures 1-6. Since the three small cysts shown in Figures 1 and 2 contained friable material, a good deal of it was undoubtedly lost in the making of the section with the saw, but this was not the case with the larger one, shown in Figure 3, which was cut wholly to one side.

Unfortunately, the contents of the cavities shown in Figures 1 and 2 were not examined, but those from the cavities shown in Figures 3 and 6 were examined immediately and also in paraffin sections. Since all the bodies had lain from a year to several years after death before completion of the dissections, it is clear that a portion of the fluid contained in some of the cavities was lost by evaporation, and that, hence, the contents of some of them, were firmer than during life. Although the section of the head containing the cavity shown in Figures 3 and 4 was not made until about a year and a half after death, it is clear that but little evaporation occurred in this case, for the content still was quite thin and the cavity full. The same thing was true of the firm amber-colored mass present in another cyst, shown in Figure 6, which filled the cavity completely. This also suggests that probably not a great deal of evaporation takes place even after more than a year, under our present method of embalming and preserving the bodies. It is not at all improbable that a great deal of the fluid in the cysts might be absorbed antemortem and the contents thus gradually become thickened as in the last case observed.

Fig. 2.—Single, somewhat larger, similar cyst in about same position. (Compare Fig. 1.)

On microscopic examination, the glairy content of the largest cyst was

found to contain some plaques of degenerate, desquamated epithelium, and large numbers of individual epithelial cells in an amorphous mucoid mass, but there were no leukocytes. The nature of the contents is revealed fairly well in Figure 7, which shows an excess of epithelium because the material was scraped lightly from the wall. Some portions of the thin fibrous lining which was detached easily *in toto* were covered by a single layer of cuboidal epithelium, shown in Figure 8. Cylindric cells are evident nowhere on the wall or among the contents, though such might originally have been present, and have been reduced in height through pressure atrophy. Some of the plaques suggest the presence of squamous epithelium. It is more probable that the cuboidal epithelium may be regarded as transitional between the cylindric epithelium of the nose and the stratified squamous epithelium of the mouth. The content and structure of the wall of the last cyst were similar in all respects except that there was much less desquamation.

An interesting and also significant thing is the presence of cords and masses, as well as scattered cells, of epithelium, in the thin fibrous wall, as shown in Figure 9. Since the presence of an invasive neoplasm can be excluded in this case, this epithelium probably could only have gained this location in the course of embryonic development. Its nature and distribution show clearly that it was not malignant in origin, and the entire absence of polymorphonuclear leukocytes

Fig. 3.—Much larger cyst of same kind, mainly to left of median line. There was no communication with the alveoli. (Compare Figs. 1-2.)

both among the contents and in the fibrous wall of this cyst speaks against an inflammatory origin in spite of the edentulous nature of the jaws.

The presence of a secondary infection manifestly could throw doubt on the noninfectious origin of such a cavity, if a layer of lining epithelium were not present, unless it is assumed that infection alone can stimulate epithelial remnants to form cysts. If these cysts are to be regarded as arising in connection with in-

Fig. 4.—Portion of right side of head containing small part of cyst shown in Figure 3.

fectious granulomas, secondary cavities in which actually can become lined by epithelium arising from the *débris epitheliaux paradentaires* of Malassez[3]

3. Malassez, Louis: Existence of Masses of Epithelium Round Roots of Adult Teeth in Normal State, Brit. Dent. Ass'n, 6. 1885. Sur le rôle des débris Epitheliaux paradentaire, Arch. de Physiol., 5, 1885.

(1885), as asserted repeatedly in the literature, it certainly is strange that we found eight of them near the line of suture of the maxillae, and none elsewhere in the jaws of 600 cadavers. We have, of course, seen many abscess cavities, especially in connection with the bicuspids and molars, but we have encountered no cysts like these. Moreover, the presence of two superimposed cysts a considerable distance above the roots of the incisor teeth but independent of them, and some distance from each other in the incisor canal, as shown in Figure 1, indicates that they probably are not infectious in origin.

It is interesting that neither Matiegka[4] (1900), nor Le Double[5] (1906), encountered such cavities in their careful and comprehensive studies of the maxilla. This may be due to the fact that they studied entire, not sagittally cut, skulls. Le Double says that the median sagittal palatine canals (of Scarpa) are originally blind, particularly the anterior, and that they contain only vessels and nerves when the lateral canals (of Stensen) themselves are blind. Le Double further states that LeBoucq[6] (1881) found that the vasculonervous trunk which passes through each of Stensen's canals in fetuses and adults is separated, during a portion of its course, from the lining mucosa of the canals, by a mass of epithelial cells disposed in concentric layers. This being the case, it follows that cysts could form from it and that a similar condition probably could also exist in connection with the canals of Scarpa. It is not uncommon to find in adults that a diverticulum of

4. Matiegka, F.: Sur les variations et les Anamolies du Palais Humain, Prague, 1900.

5. Le Double, A. F.: Variations des os de la face de l'homme, Paris, 1906.

6. Le Boucq, H.: Le canal nasopalatine chez l'homme, Arch. de Biol., 2, 1881.

the mucosa extends upward a considerable distance from the mouth toward the nasal cavity, through the anterior palatine canal or downward from the nasal cavities. Later, closure of such a diverticulum could lead to cyst formation, but since there always was bone surrounding the cysts here considered, and no matter how thin in some places, it never bulged, such an origin of the larger cavities would seem to be excluded by this fact alone.

plasia had occurred as alleged in case of cysts of the adenoids, under rather different conditions, however. According to Turner[7] (1898), a similar metaplasia occurs in the case of cysts derived from the paradental epithelial remnants of Malassez. The latter found no definite cavities in any of the epithelial remnants examined by him, but a number of later investigators did find them. Malassez may not have found any because the ma-

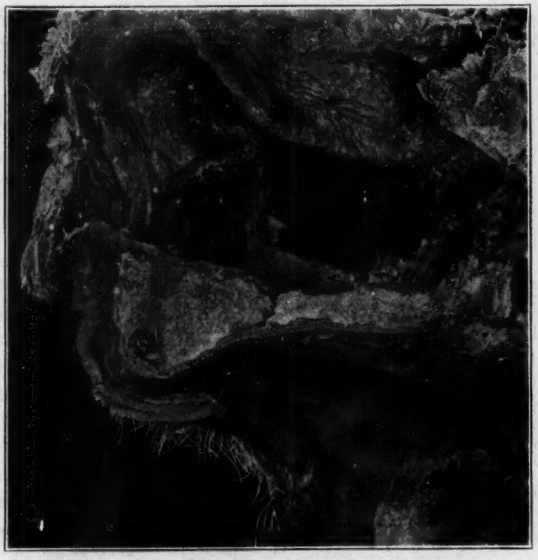


Fig. 5.—Similar cyst of left side, but almost exactly median in position. (Compare Fig. 4.)

In the case reported by Congdon, the bony wall was deficient over a small area of the palatine surface, but this defect in the bone may have resulted from absorption and could not well be related to the origin of the lining of the cyst, because it was columnar epithelium. Invasion of epithelium through an opening from the mouth into an abscess would have produced a squamous lining unless metaterial which he used contained only epithelium in a quiescent state, for Rywkind[8] (1927) carefully described the

7. Turner, J. G.: Dental Cysts, J. Brit. Dental Assn., 19:711-732, 1898.

8. Rwykind, A. W.: Die Bedeutung des Deckepithels der Mundhöhle für die Morphologie und Pathologie des paradontalen produktiven Vorgänge, Deutsch. Monatschr. f. Zahnheilk., 45:673-682 (Aug. 1) 1927.

process, as did Hill[9] (1930), in connection with root granulomas.

The nature of the contents, the character of the fibrous wall and, particularly, the presence of a lining epithelium probably exclude an infectious origin for the cysts here reported, for an abscess cavity probably could not become so completely lined by an invading epithelium except under conditions of open drainage, or become so completely surrounded by bone after extraction of an offending tooth. Moreover, all of the cysts were distinct from the nearest teeth. Origin from the epithelial remnants in the periodontium of the incisors can be excluded by the position of these cysts and their independence of the roots, but that leaves dentigerous and bone cysts to be considered.

Fig. 6.—Portion of left side of head which contains most of cyst cavity. This cyst was filled completely by a firm amber-colored mass and occupied the mid-portion of the left major incisor canal.

9. Hill, T. J.: Epithelium in Dental Granulomata, J. Dent. Res., 10:323 (June) 1930.

These also can be excluded, it seems to me, on the basis of location. It would be extremely unlikely that such rare things as bone cysts, of uncertain origin, said to occur rather in long bones, should occur so often near the midline of the maxilla, or that dentigerous cysts, more commonly associated with molar teeth, should be so relatively common in the interincisive region of the maxilla, so rare elsewhere, and not be associated with tooth rudiments in any of the cases of this series.

The presence of bone or dentigerous cysts, as commonly understood, could hardly escape attention in the mandible, under our method of dissection, and probably would not be overlooked elsewhere in the maxilla. Yet we never have encountered a single specimen of either during the time that we have seen nine cysts such as here considered. It seems to me that it is entirely possible that dentigerous cysts may not always contain remnants of teeth as is generally assumed. The development of such cysts might stop at any stage, yet it is customary to exclude from the dentigerous class all cysts not containing teeth or tooth rudiments.

Fig. 7.—Microscopic appearance of contents of cyst shown in Figures 3 and 4.

There seems to be much confusion still regarding cysts of the jaws, in spite of the fact that, according to Scudder[10] (1912), there are only two kinds: (1) follicular or dentigerous cysts, and (2) periosteal or root cysts. The latter, ac-

10. Scudder. C. L.: Tumors of the Jaws, Philadelphia: W. B. Saunders Co., 1912.

cording to Scudder, may arise at any time, and often are associated with normally placed adult teeth, often carious. Nevertheless, under the head of compound follicular and composite odontomas, a subdivision of dentigerous cysts (follicular odontoma), Scudder mentions dental cysts which never contained rudimentary teeth or tooth remains and were usually lined by granulation tissue, occasionally by epithelial cells, and which seem to be regarded by him as characterized by a continuous growth. That dental or root cysts resulting from infection are subject to continued growth seems to be generally believed.

Scudder wrote the foregoing in the discussion under the main head "compound follicular and composite odontomata," which he says are composed of varying combinations of the several tissues of the tooth follicle and may contain fibrous tissue, cysts, bits of enamel, dentin and cement. He states, further, "Often queerly shaped masses resembling, in some instances, teeth, are found loosely attached or free within the cyst wall."

When speaking of the second class of periosteal or root cysts, Scudder stated that they are almost never seen in connection with milk teeth, that they rest in the smooth bony cavity of the tooth alveolus and that the wall of the cyst is made up of connective tissue lined with epithelial cells like the cells of the enamel pulp. Scudder holds that the origin of these root cysts is from root granulomas.

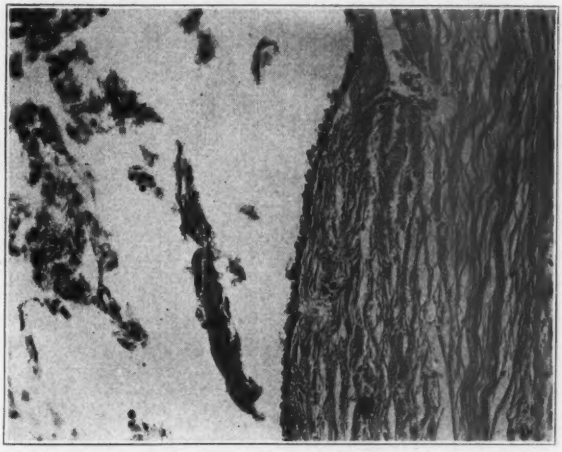


Fig. 8.—Portion of cyst wall of same specimen lined by cubical epithelium. (Compare Fig. 7.)

He says:

> The root granuloma is a small mass of granulation tissue attached intimately, to the tooth root. . . . There are at times found epithelial, cylindrical and stellate cells, which are the analogue of the enamel organ. . . . The root cysts begin in the center of these granulomata. The normal epithelial cells in the center of these granulomata soften, break down, and undergo fatty degeneration, and hence form the starting-point for the cyst. The primary occasion of the granuloma is a periodontitis. The sequence, then, of the pathology of the root cysts is as follows:

Some irritant causing a periodontitis; as a result of the periodontitis a granuloma forms; this granuloma softens in the center, and the cysts results. . . . The cysts may grow to enormous size. The ordinary size is that of a walnut. . . . If there is a periostitis in the jaw nearby, it may become secondarily infected.

Black[11] (1915), who believed that inflammatory processes are always necessary for the production of epithelial cysts found in connection with the roots of the teeth, wrote:

In case of an inflammatory movement, there is at once a new growth, or increased

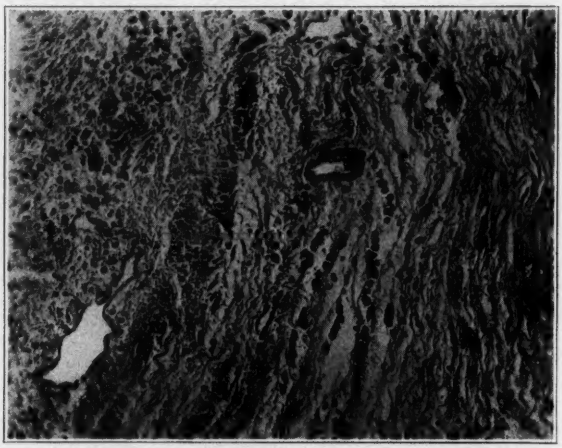


Fig. 9.—Another portion of same cyst wall containing cords of epithelium scattered about among fibrous tissue. (Compare Figs. 7-8.)

growth, in these epithelial strings. If there is in the neighborhood a group of cellular elements which are unable to maintain their vitality, they are hedged about at first by the growth of dense epithelial strings. As the area of seminecrotic tissue enlarges, these epithelial strings broaden into sheets, which tend to surround and enclose it. If this movement of the tissues is complete, the area will also have become surrounded by connective tissue cells outside of the epithelium. This constitutes the formation of a cyst.

According to Endelman[12] (1927):

Dental or root cysts are in the nature of neoplasma traceable to some source of irritation which may be bacterial or mechanical. The sinusless chronic dentoalveolar abscess or granuloma is invariably of bacterial origin. The dental or root cysts—the most commonly encountered form of intraosseous cysts of the jaws—are found associated with pulpless teeth in which the sterilization and filling of the root canal have been incompletely carried out. However, they may also be found in connection with teeth containing vital pulps, but teeth the peridental membranes of which for a long time sustained mechanical irritation of a mild order. Teeth in various degrees of malocclusion are the ones likely to become the seat of these cystic developments. They vary in size from those one-eighth of an inch in diameter to those one inch in diameter and in rare instances they attain even greater dimensions. . . . More recent investigators lean toward the acceptance of the most

11. Black, G. V.: Special Dental Pathology, Chicago: Medico-Dental Publishing Co., 1920.

12. Endelman, Julio: Special Dental Pathology, Ed. 2, St. Louis: C. V. Mosby Company, 1927.

plausible of these various sources, namely the sheath of Herting [Hertwig?], and extension into the follicular wall of the commingled cells of the internal and external layers, the stratum intermedium and the stellate reticulum of the enamel organ.

Black and others, on the contrary, held that the cells of the enamel organ always completely disappear, but this seems very doubtful.

In considering the origin of these cysts, Osgood[13] (1929) wrote:

Where a granuloma undergoes central softening, these epithelial cells grow in between the living and the dead tissues making an epithelial wall or line of demarcation above the cavity or lumen which forms within this caseated material. (Thoma.) If the contents of this cavity liquefy, we then have an epithelial-lined cavity containing fluid—in other words, a true epithelial cyst. Such cysts may contain nothing more than sterile fluid.

This statement of the origin of the cysts seems to be based on the observations of other investigators, for Osgood refers to Black and Thoma. Thoma[14] (1916), on the other hand, depended on Dependorf, but quite pertinently added that although cysts may form in both jaws, such a course of events as postulated in the foregoing quotation must happen "extremely seldom or we would meet with cysts more commonly in these days where granulomata are found in almost everybody's mouth."

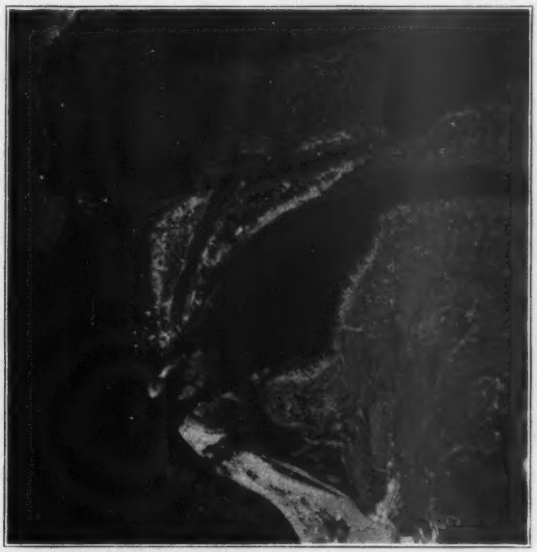


Fig. 10.—Portion of right median sagittal section of head showing presence of very long left nasopalatine diverticulum open above only and arising very far dorsally.

13. Osgood, H. A.: Teeth and Jaws Roentgenologically Considered, Ed. 2. New York: Paul B. Hoeber, 1929.

14. Thoma, K. H.: Oral Abscesses, New York: Ritter and Company, 1916.

We may recall in this connection that Dowsett[15] (1901) reported a case in which he thought that the dental cyst arose "from the root of a living tooth, a second premolar." What the author very evidently meant was that the cyst arose in the peridental membrane. Although Dowsett's hearers seriously questioned the correctness of his supposition, he insisted on it and referred to Römer, who is said to have described cyst formation connected with the roots of teeth wholly independent of infectious processes. Unfortunately, this work is inaccessible to me.

Fig. 11.—Median shadow said to represent anterior palatine fossa. (Ivy.)

It is of special interest in this connection that Baker[16] (1891) concluded that ciliated epithelium which he found present in a dentigerous cyst probably arose from the peridental epithelial remnants. Baker found a cyst which he claimed was infectious in origin near the root of a left upper molar and another lined by "a double row of columnar ciliated epithelium" for its greater portion. Vitalis[17] (1858) also reported finding a cyst as large as a "small hazelnut," filled largely with epithelial débris, in connection with the root of a second upper lateral incisor, which had been reduced to a stump by caries! Vitalis believed that his cyst arose from a dental sac which had not disappeared with the eruption of the tooth, but continued to grow and "secrete" the epithelium which accumulated in the cavity.

In his very meritorious investigation, Turner (1898) stated that dental or root cysts always are of epithelial origin and may be multilocular and lined by ciliated epithelium. Twenty-one out of twenty-five cysts were associated with the roots of molar and bicuspid teeth in both jaws, and all cysts of his series were connected with dead roots. Turner emphasized that such cysts grow continuously and that extraction of the root does not stop growth.

Except in connection with abscess formation, it is difficult to see why such a relatively small amount of granulation tissue as that associated with an infected tooth should break down for lack of nutrition and so form a cavity. Moreover, if it did, it probably could not become lined by epithelium whether single or many layered, and the purulent, fibrous wall of a closed cavity formed by an abscess in connective tissue manifestly would not constitute a good nidus for the attachment of proliferating epithelium, no matter what its origin. Such an epithelium, if originally present, would be more likely to be destroyed than stimulated to proliferation, although epithelialization could arise from invasion from

15. Dowsett, E. B.: Dental Cyst Arising from Root of Living Tooth, Tr. Odontol. Soc. Great Britain, 33, 1901.

16. Baker, W. W.: Pathology of Dentigerous Cyst, J. M. Sc., 92, 1891.

17. Vitalis, M. O.: Un cyst developpe dans le maxillaire superieur gauche, Bull. Soc. Anat., 33, 1858.

the oral cavity or the maxillary sinus, or the nasal cavity in the course of healing.

Granulomas connected with teeth are relatively vascular, and are composed of connective tissue containing epithelial rests, infiltrated with leukocytes, fibroblasts, plasma cells, macrophages, etc. A pus cavity could easily form in such tissue, and apparently often does so; but this would be the result of infection and necrosis and would produce a relatively thick wall which could not be lined by epithelium except by invasion or if infection and cavity formation occurred in an epithelial mass present at the place of infection.

granulomas, Hill confirmed the findings of Malassez that epithelial rests are constantly present in the periodontal membrane. Hill found them constantly present in serial sections of granulomas and concluded that epithelial-lined root cysts arise in consequence of necrosis in the interior of epithelial masses as he says Römer[18] and Rywkind had suggested. Hill usually found squamous epithelium lining the cavities of granulomas, but occasionally a single row was present although epithelium might be absent altogether. In two instances, the epithelium lining cavities formed in consequence of necrosis was tall columnar and ciliated as in the cases reported by Römer, Hopewell-Smith and Baker. Hill concluded that this ciliated epithelium was derived from that of the maxillary sinus and emphasized that such a conclusion is supported by histologic similarity and in "our experience by its restriction to teeth in immediate continuity with the antrum." This conclusion implies that the ciliated epithelium lining the cavities of two of these cysts must have entered the cavity formed in a granuloma in con-

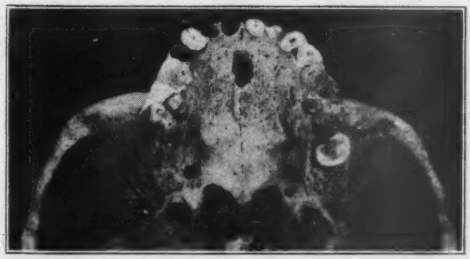


Fig. 12.—Portion of skull from American Indian, taken from below and showing a large anterior palatine foramen opening into equally large deep common canal.

An abscess cavity which arose in granulomatous tissue might, to be sure, contain some of the peridental epithelial remnants, but whenever a thin-walled cyst surrounded by bone is lined by epithelium, it would seem safe to assume that the cavity is not infectious in origin, although it might have become infected later on, or an infection might have caused epithelial proliferation. This conclusion receives considerable support from the recent investigation of Hill (1930), which came to my attention long after the completion of my manuscript. In a careful histologic examination of 142

18. Römer, Oskar: Die Pathologie der Zähne, Handbuch der speziellen pathologischen Anatomie und Histologie, Berlin: Henke and Lubarsch, 1928, Vol. 4.

sequence of necrosis due to "avascularity," from the maxillary sinus after the establishment of an open communication between the former and the latter. The occurrence of ciliated epithelium in the cases of root cysts previously referred to, and the presence of ciliated epithelium in cysts of the pharyngeal tonsils, as well as embryologic considerations regarding the place and time of origin of the paradental epithelial remnants, makes the assumption of a sinusal origin of ciliated epithelium unnecessary. This is especially true when it is recalled that it is not always stated that the nests of epithelium

come deficient is suggested by the fact that the epithelium lining these cysts may be single layered. It is well to remember, in this connection, that it once was assumed that the epithelium in root cysts was an extension from that of the mouth after the establishment of communications between an abscess cavity and the latter, but this suggestion seems to have been abandoned.

The median or nearly median position of the cysts that we found, the independence of all of them from the roots of the superior central incisors and their sole occurrence, in our experience, in the

Fig. 13.—Roentgenogram said to represent congenital defect. The compacta bounding the cyst is clearly indicated in the roentgenogram. (Osgood.)

are composed of squamous cells and that Hill speaks of "acini" of epithelium as being constantly present in root granulomas.

There would seem to be no good reason to suppose that paradental epithelial remnants cannot form cysts after the manner of epithelial remnants elsewhere, as Turner first suggested. Moreover, that not all root cysts which were found lined by epithelium arose in consequence of necrosis in the interior of epithelial masses the nutrition of which had be-

interincisive region of the maxilla in association with the incisor canal, seem to indicate that they are other than dentigerous or paradental in origin.

Although supernumerary incisors are more common, I do not believe that the cysts here specially considered arose from such rudimentary tooth anlagen. Since the dental ridge is continuous across the midline of the fetal maxillae, it would be unsafe to assume that the epithelium always degenerates completely in the interincisive region. If some of this epitheli-

um should remain, it well might lead to cyst formation. These cysts would lie ventrally, that is, anteriorly to the incisive canal. I have seen only one instance that answers to such a condition and unfortunately could not make a satisfactory examination of it.

It also is likely that some of the epithelial remnants along the line of fusion of the hard palate can give rise to cysts, as the cases of Congdon and Rixford suggest, but the probability is that most of them arise from the epithelial remnants left from the time of formation of the palate. The epithelial cords

Fig. 14.—Common anterior palatine canal shown in Figure 10, taken in exposure customary in dentistry.

and nests associated with the latter were described more fully by Berengrün,[19] (1909), Peter, [20] (1914, 1923), Rawengel,[21] (1923) and Rydzek[22] (1923). Berengrün found epithelial remnants always present after formation of the palate, in a midline, and believed that they result from fusion of the lateral palatine processes and the nasal septum. He found them from the fifth month of antenatal life to two and one-half years postnatum. They always were present in the anterior region of the palate next to the alveolar processes, but Berengrün concluded that these epithelial remnants always degenerate completely because of lack of function. He further believed

Fig. 15.—Same canal (Fig. 14) taken directly from above.

that they no more give rise to neoplastic growths than the epithelial remnants connected with the formation of Müller's ducts.

19. Berengrün, Paul: "Epithelperlen" und Epithelstränge in der Raphe des harten Gaumens, Arch. f. Entwgsch. der Organ., 28, 1909.

20. Peter, Karl: Die Entwicklung des Säugetiergaumens. Ergb. d. Anat. u. Entwgsch., 25, 1914; Die Entwicklung der Nasengaumenstränge und anderer Epithelzüge im vorderen Teil des menschlichen Gaumens, Arch. f. Mikr. Anat., 97, 1923.

21. Rawengel, Günter: Die Nasen-Gaumengänge und andere epitheliale Gebilde im vorderen Teile des Gaumens bei Neugeborenen und Erwachsenen, Arch. f. Mikr. Anat., 97, 1923.

22. Rydzek, Artur: Ueber den vorderen Gaumenschluss beim Menschen, Arch. f. Mikr. Anat., 97, 1923.

According to Peter, the so-called nasopalatine ducts really are cords which may form in continuity or in a discontinuous way, and that unless the embryologic material is examined at the right time, confluence of the fragments may give the impression of origin in continuity. From an examination of twenty-nine canals in young fetuses, Peter concluded that their origin in continuity is relatively rare. Usually, he says, these cords are found divided into three portions: (1) a solid sprout extending down from the nasal cavity; (2) a similar extension from the oral cavity, and (3) a cord of cells lying in the connective tissue between these two. The first portion was said to be composed of the cells characteristic of the nasal cavity; the second was found clothed by a many layered squamous epithelium characteristic of the palate, and the third was composed of degenerate cells.

Fig. 16.—Edentulous skull from below showing an irregular opening in anterior palatine region which communicates with cyst cavity about 1 cm. in diameter. The very thin bone in the region of the anterior palatine foramen has been damaged somewhat. The major anterior palatine canals are entirely obliterated and their superior foramina greatly enlarged through pressure absorption from the cyst. Had this cyst become infected or continued to grow, it would probably have appeared on the palate and in each nasal cavity and might have perforated in any one or all of these three places.

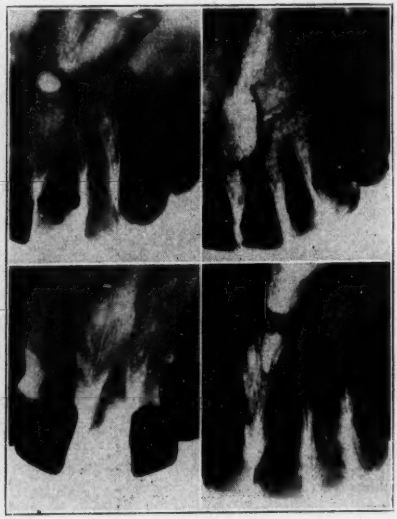


Fig. 17. — Roentgenograms selected from those supplied by Dean McDowell containing radiolucent areas probably due to cysts. Above, left, the left superior anterior palatine foramen is evident. Below, right, the presence of two cysts is suggested.

Peter stated that these epithelial cords (*Stränge*) increase "enormously" in mass during the second half of fetal life, and may fuse with similar epithelial formations of other origin, such as prolifera-

tions in the posterior margin of the palatine papilla, or in the region of the *Staungsleisten* formed in consequence of the approximation of the lateral palatine plates and compression of the primitive palate. Peter further stated that the middle portion of the epithelial strands may become canalized, perhaps by fusion of their blind ends to form *Nasengaumengänge,* in which case one meets the ostia of the ducts (*Gänge*) at the lateral margin of the palatine papilla itself. If these ducts fuse with epithelial tubes arising from the posterior margin of the palatine papilla, the nasopalatine ducts may open by a single ostium on the palatine papilla, thus explaining Merkel's observation.

Fig. 18.—Case of Dr. Sloman in which the adjacent incisors were vital.

The more recent investigations of Peter (1923), Rydzek (1923) and Rawengel (1923) afford a fairly satisfactory explanation for the occurrence of the cysts here reported. Although Peter states that the epithelium which forms the *Stauungsleisten* always disappears, the presence of exactly median cysts such as here reported indicates that it probably does not always do so. Peter's careful and extensive embryologic investigations suggest that the cysts which were somewhat lateral in position arose from the epithelium of the *Grenzleisten* or nasopalatine cords, and from the *Staungsleisten* when they were median and practically intraosseous in position. Cysts that are median in position, but occupy the region of the palatine papilla, i.e., the common nasopalatine canal or the nasopalatine fossa, may have arisen from epithelial formations from the posterior border of the palatine papilla itself, or possibly from epithelial remnants along the line of fusion of the hard palate. That Rawengel is mistaken in holding that the epithelial remnants of the nasopalatine cords which do not come into relation with the nose and mouth always degenerate is indicated quite clearly by some of the instances of cyst formations here reported.

Fig. 19.—Root and incisor cyst. (Case of Dr. Sloman.)

I have seen only one case of what appeared to be a patent incisive canal in a living adult, but instances of diverticula extending downward from the mouth toward the nasal cavity in the anterior palatine canals such as are represented in Figure 10 are not uncommon. Although these diverticula are of varying length, I have never seen one that extended into the mouth, although it is not uncommon to find them extending as far as the soft tissues on the roof of the palate. I surmise that these diverticula are more common that I can realize, because we probably destroy some in making the saggittal

sections with the carpenter's saw, always cutting a little laterally to the nasal septum. Sometimes, these diverticula have dilated blind ends, and it was because of this that I first suggested that these cysts might really represent paranasal sinuses.

Since, as Peter (1923) emphasized, nasopalatine ducts are not formed in consequence of imperfect closure of the palate in man, the nasopalatine diverticula must result from canalization of the epithelial cords which arise after complete closure of the palate. Although these diverticula can become closed secondarily, it is unlikely that such a process can give rise to

Fig. 20.—Bite exposure of case in Figure 19, clearly showing great enlargement of superior anterior palatine foramina due to pressure absorption from cyst.

cysts such as are here considered. Accumulation of secretions in the closed diverticula or inflammatory exudates would be likely to cause rupture in the direction of the previously open diverticula rather than result in cyst formation. Peter also called attention to the fact that patent ductus palatini occur in the adult, and that diverticula that extend down from the nose are more common than those which extend up from the mouth. He held that midportions never occur in the adult. Yet it is precisely from these isolated midportions that most of the cysts here considered may have arisen, for, as stated above, it is very unlikely that they could form from open diverticula, either from the nose or the mouth, which later became constricted off and surrounded by bone. Such an origin would seem to be precluded by the presence of a continuous wall of surrounding bone except in the region of the incisive foramina, in all of the nine cysts except two.

Since Peter and Rawengel found that these epithelial remnants in the region of nasopalatine closure undergo marked hyperplasia in late fetal life, and not infrequently become cystic, all that is necessary is to assume that some of these cysts or noncystic remnants of epithelium persist and increase in size later on. This could easily result from proliferation and the accumulation of secretion with consequent enlargement of the cavity, through pressure atrophy of the surrounding bone.

The nasopalatine nerves and vessels always were outside of the thin, easily detachable, fibrous cyst wall, and the size of several of the cavities suggests that these structures must have been subjected to prolonged pressure during the enlargement of the cavities, and also have been displaced laterally. Since the growth of these cysts occurs at the expense of the soft tissues in the canal or of the surrounding bone, it is evident that they may appear in the nose, on the palate or under the upper lip. Since the loss of the surrounding bone results from pressure resorption which, in the case of a cyst, is equal in all directions, the cyst remains approximately spherical in spite of the fact that the surrounding bone is perforated by the incisive canals, for the latter usually are so small in caliber that they probably have little effect in reduc-

ing the resistance to the growth of the cyst in their direction. Whenever the cysts arise from the epithelium in a large common canal or fossa, they would naturally extend more in the direction of the opening and thus become evident on the palate relatively early, unless they became quiescent before they had reached a sufficient size.

The occurrence of secondary infection might change the conditions, and whenever absorption of the surrounding bone becomes rapid, the wall of the cyst would no longer be bounded by a thin layer of compacta as is indicated in many of the roentgenograms, particularly that from Osgood. Since the anterior palatine vessels and the nasopalatine nerves must be subjected to pressure from the growing cysts, it is more than likely that some of these individuals must experience local and probably also referred pains. Should the growth be very slow, and then later cease altogether, it might fail to give rise to either signs or symptoms and remain entirely undiscovered except through roentgenograms or dissections. As a rule, persons having these cysts probably are unaware of their existence.

It is peculiar, indeed, that the epithelial remnants which Peter also found so common in the region of fusion of the hard palate have not been shown to lead to cyst formation, for we have never encountered one in this region, in median saggittal sections of the head, except the one reported by Congdon, which had a somewhat different location. It is possible that closer scrutiny will reveal some to us in the future. But even if we do not find any, the suggestion that some of these cysts located as was that of Congdon arise from the epithelial remnants so well described by Berengrün and Peter seems very likely. It was of particular interest to me to learn from my colleague, Emmet Rixford, Sr., that he recalled removing a cyst from this region of the maxilla which extended back into the hard palate. A second possible case is one under observation by my associate, Dr. Nagel, in which a considerable portion of the left half of the hard palate is occupied by cysts.

Since I have found no mention of such cysts as those here reported, in the literature of anatomy, pathology or dentistry, I am constrained to conclude that they were taken for congenital defects, anterior palatine fossae or abscess cavities; usually the latter, as many have since testified. Shadows alleged to represent anterior palatine fossae and congenital defects are found in the illustrations in texts on dental roentgenography. Since so many roentgenograms of this region of the maxilla are taken by dentists in the course of their practice, shadows of these cysts must have been encountered rather frequently. Figure 11, which is a roentgenogram from Ivy (1923) (Fig. 43), shows a shadow which may be that of such a cyst, although the legend accompanying this figure reads: " . . . sharply defined dark area is anterior palatine fossa, somewhat resembling the appearance of bone destruction and cyst formation. Both teeth, however, contain vital pulps, and normal peridental line can be followed around each root." The identification of the peridental line was not possible in the illustration in the text, and does not show in the reproduction in Figure 11, although I do not therefore question that it was evident in the original roentgenogram. Since the outline of this shadow is somewhat irregular, it may be that of a large common incisor canal, such as that represented in Figure 12. The latter bears some indication of having suffered from pressure absorption.

Osgood (1929) likewise spoke of two comparable radiolucent areas in a roentgenogram (No. 78) as "shadows of the anterior palatine foramen (which) overlie the apices of the upper central incisors simulating pathology." In connection with Figure 81, Osgood spoke of a similar, very much larger, very typical radiolucent area in the interincisive region of the maxilla as follows: "A central shadow with a white line is seen in the upper incisor region, simulating an antrum cavity or a cyst." Of Figure 82, here reproduced as Figure 13, it is said: "An anterior view of the same area. The area proved to be a congenital defect." In my limited experience with dental roentgenograms, I never have seen a shadow of a maxillary sinus that could possibly have been mistaken for a cyst such as I am considering, if the roentgenogram is taken from in front, and it is regrettable that Osgood did not comment on the nature of this surprising congenital defect. Allowing for magnification, the shadow of it was approximately a centimeter from right to left and a centimeter and a half in a vertical direction and hence somewhat larger than the largest cyst which I have observed.

A similar roentgenogram is given as Figure 19, in Mead[23] (1927). The legend of this reads: "Radiogram showing the anterior palatine foramen and the nasal cavity, which might be mistaken for pathology." This shadow also lies almost exactly in a midline and none of the many fine roentgenograms of this region of the maxillae reproduced in that text show such a shadow, although anterior palatine fossae very probably were present in most of these cases. This reasoning probably holds for Figures 80 and 81, for example, which are exceptionally clear. Indeed, I never have seen the incisive canals clearly indicated by shadows throughout their entirety in roentgenograms taken at right angles to the incisors. The superior incisive foramina rarely show as a single shadow if the roentgenogram is taken somewhat from one side. The inferior foramina of these canals or that of the fossa, when the latter is present, on the contrary seldom show, and as far as I have been able to ascertain, the latter is seldom large enough to produce such large shadows as those shown in the figures above referred to.

Although I have not carefully examined them, I have seen more than a thousand incisive canals in dissecting room material, and I feel quite certain that such a large fossa as is implied by the shadow in some of the roentgenograms from Ivy[24] and Mead woud be relatively rare, and such as that given by Osgood would probably be unprecedented. Such a large fossa could not easily have escaped detection by anatomists, and even if encountered in the living, might not throw such shadows in roentgenograms taken as these were.

From a study (unpublished) of the anterior palatine canals and especially of the fossa, Howard, of this laboratory, found the latter present in 52.4 per cent of 164 cases of cleaned skulls or parts thereof. The average size of these eighty-six fossae was 4.5 mm. in a transverse and 3.9 in a horizontal dorsoventral direction. The average depth as measured from the posterior or dorsal was 4.1 mm. The corresponding measurements of the largest fossa in the skull of an Ameri-

23. Mead, S. V.: Diseases of the Mouth, St. Louis: C. V. Mosby Company, 1927.

24. Ivy, R. H., and Ennis, L. M.: Interpretation of Dental and Maxillary Roentgenograms, Ed. 2, St. Louis: C. V. Mosby Company, 1923.

can Indian from a local mound were 6.6, 7 and 12.5 mm. respectively, but the configuration of the walls of this fossa suggested that it probably contained a cyst. It is evident from this that some, if not all, of these fossae are large enough to cast a shadow in a roentgenogram, but they apparently do not do so, or do so but rarely, in dental roentgenograms taken with the usual exposures. It would be a simple matter, to be sure, to discriminate between these cysts and a large anterior palatine fossa by means of puncture whenever stereoscopic roentgenograms or those taken from directly above leave one in doubt.

I was especially interested in learning what kind of shadow would be cast by so large a canal as that in the Indian skull mentioned above if taken from in front, and was surprised by the result. Although a number of exposures were taken both by Dr. Powers, a specialist in this work, and by us, we got only the results indicated in Figure 14. With exposure in the long axis of the canal, a very definite shadow was cast, as is shown in Figure 15, but no one could have surmised what this skull contained from the roentgenogram in Figure 13.

The same thing is true regarding the large cyst cavity in the senile edentulous skull shown in Figure 16. This cavity was approximately 1 cm. in size and spheroidal in form. The anterior palatine foramen, if present, was enlarged through injury incidental to cleaning and handling the skull, for the bone in this region was papyraceous. The major anterior palatine canals were completely obliterated by progressive shortening by absorption. Only the superior foramina remained, and these were greatly enlarged through absorption due to pressure from the cyst.

That epithelial remnants in both major anterior palatine canals of the same individual may give rise to cysts is suggested by Figure 17, below, right. The four roentgenograms reproduced in this figure, selected from among those supplied by Dean McDowell, are good illustrations of what I regard as evidence of the existence of cysts. The cyst at above, left, apparently enlarged the left superior anterior palatine foramen, which consequently shows as a clear area. The irregular form above, right, suggests that it may be due to a large common anterior palatine canal or to a deep fossa, although this is rather unlikely.

Since, according to Le Double, a single median common incisive canal (the terminology of this region has been discussed[25]) is present in about 3 per cent of cases, it was interesting and at first surprising to me that no shadow was cast by it or the incisive fossa in routine dental roentgenograms, until I correlated the direction of the exposure of the patient's jaw to the rays with the direction of the canal, and considered the thickness and structure of the bone in front of it and the incidence of deep incisive fossa. As far as I can learn, it remains unknown as to just why an anterior palatine fossa is present in some cases and a common instead of a single canal in others, although the extent of fusion of the nasopalatine cords and the extent of preservation of the *Stauungsleisten* and of epithelial development in the palatine papilla probably are determining factors. It is likely that the absence of one or the other of the major anterior palatine canals may be due to a very early or complete degeneration of the epithelium.

25. Meyer, A. W.: Inadequate Terminology Concerning Anterior Palatine Region, Anat. Rec., 49: (Jan.) 1931.

The line of suture of the maxillae frequently affects the depth of the shadow in roentgenograms, deepening it in younger jaws and lightening it in older ones, and bisects the shadow due to the fossa in roentgenograms taken from in front and above. The former effect is due, of course, to incomplete ossification, and the latter to the presence of denser bone in the region of the suture in older persons. It also is significant that no definitely delimited intensification of the shadow from the incisive canals was evident in any of the 1,768 roentgenograms of the maxillae kindly put at my disposal by Dean Millberry and Professor Marshall of the College of Dentistry of the University of California, and by Dean McDowell and Dr. Sloman of the School of Dentistry of the College of Physicians and Surgeons. Moreover, the rectangular intensification of the shadow due to this canal or canals should extend in a direction approximately parallel to the anterior surface of the alveolar portion of the maxilla and the central incisor teeth, in roentgenograms taken in the usual way. The incisor canal can only show as a more or less circular shadow if it is exposed on end, either from below or from above, but in such an exposure the teeth would, to be sure, also be taken on end instead of from in front. A deep fossa could cast a pyriform shadow in roentgenograms taken from in front and above.

I do not know what determines the depth of the incisive fossa. The plane of its aperture, i.e., that of the inferior incisive foramen, depends on the relation of the palatine processes of the maxillae to the alveolar processes, but its anterior posterior width should largely determine whether it will be indicated by a shadow in such roentgenograms. Most of the anterior palatine fossae in dry osseous preparations and most of those that I have seen in the dissecting room are shallow and small in caliber and hence probably would not cause a recognizable shadow in roentgenograms taken from the front. I do not doubt that some anterior palatine fossae and canals can cause a shadow such as would be produced by a cyst of comparable size.

Dentists both at home and abroad caution against the misinterpretation of these shadows, and I can hardly believe that all of them are due to cysts. It is interesting that Grassl[26] (1929), for example, in referring to shadows of the "foramen incisivum" does not mention cysts when considering the possibilities of misinterpreting dental roentgenograms of this region.

Since the incisive canals usually are paired above, and since one or both canals of Scarpa may be wholly or partly obliterated, the likelihood of the production of a single or a distinctly double shadow is greatly lessened. Anything which can rightly be called an incisive fossa is present only when one or more of these canals empties into a common depression below. Although this anterior palatine fossa occasionally is deep enough to throw a shadow from above, and may do so in such exposures, even when small in caliber, this shadow, if deep, usually can be recognized without much uncertainty. In roentgenograms taken in the horizontal exposure with the rays at right angles or from slightly above, it probably would not show unless wide enough.

A good shadow of a superior foramen probably is obtained only in roentgenograms taken from the front and above or from the side, in cases in which the two incisive canals are fused above to

26. Grassl, Joseph: Beiträge zu den Täuschungsmöglichkeiten in der Zahnärztlichen Röntgenologie, Berlin, 1929.

form a single foramen and the incisive crest of the maxilla is perforated in consequence. Under such circumstances, the rays would encounter no bone in the locality of the junction of the canals in slightly lateral horizontal exposures, and it is only in roentgenograms taken in this way that a clear shadow of this foramen was noticed. When the incisive canals are separated by the incisive crest, as is the rule, shadows of both superior incisive foramina are present only very rarely. I found only a single roentgenogram in which two shadows, one for each superior incisive foramen, were present. This, I surmise, is to be accounted for largely by the structure of the maxilla in this particular case, and by the direction of the exposure. It is significant that the inferior incisive foramen (or foramina) was not evident in this case.

Although the 1,219 roentgenograms of maxillae included among the many thousands of roentgenograms put at my disposal by Dean McDowell of the School of Dentistry, College of Physicians and Surgeons in San Francisco included 332 from persons under 14 years of age, no roentgenograms of the latter are among the ten or twelve containing a clear shadow indicating the presence of a cavity near the median plane, in the interincisive region of the maxillae. No wholly unequivocal shadows were found in them. This was rather unexpected, and I am at a loss to account for my failure to find more definite indications of the presence of such cysts in these roentgenograms. Since I found only fairly definite shadows indicative of a cyst, in three instances among the 332 roentgenograms from children under 14, it is possible that cyst formation does not occur in these epithelial remnants until later years, perhaps in association with the second dentition, although that seems improbable. An examination of a large series of bodies of fetuses and new born and older infants would hence seem to be necessary in order to determine the presence of these cysts in early life. The incidence of characteristic shadows in dental roentgenograms from adults was only about one in eighty-eight or one in seventy-four cases, according to the number regarded as definite, and in cadavers in the dissecting room about one in sixty-six (nine in 600), but many small cysts were probably overlooked.

In thirteen roentgenograms among the 1,083 from adults, with a shadow that suggests definitely the presence of cysts such as are here considered, and in four others which I regarded as doubtful, the outlines of the shadows are so clear-cut and the shadows apparently so far removed from the roots of the central incisor teeth that their connection with root abscesses can, I think, be definitely excluded.

It is evident that small cysts could easily escape detection in median sagittal sections made with a large carpenter's saw by students not fully aware of what may be expected, and not skilful in the use of the saw. This applies especially to cysts such as suggested in the roentgenograms from children under 14. Such small specimens would probably be almost or indeed wholly destroyed and hence would not be observed. These cysts arising from remnants of palatine epithelium might not show in roentgenograms in the early stages any more than the incisive canals do as a rule. Even fair-sized flat cysts, which probably do not occur, might not be revealed in roentgenograms. In spite of its relatively large size, the mandibular canal showed distinctly in relatively few dental roentgenograms, no matter how clear. The same thing was true of the mental foramina, which often

open very obliquely upward and hence cause no shadow in roentgenograms taken directly from the side.

The fact that experienced roentgenologists and dental pathologists and dentists agree that some large shadows found in the interincisive region are not due to disease is of great significance in this connection, and what is now needed is especially careful scrutiny of all these cases to exclude anterior palatine fossae, and the determination of the vitality of the adjacent teeth, examination of the contents and walls of the cysts, when present, and observations on changes in size. A gross and cytologic as well as a histologic examination of the contents and wall of these cysts would make it possible to exclude an abscess cavity in all cases except those in which infection occurred in a cyst and destroyed all traces of the epithelial lining.

It would seem that the epithelium scattered throughout the wall of these cysts and that described by Berengrün and Peter in the midline of the hard palate might give rise to malignant growths. The epithelium within the wall of the largest cyst certainly seems sufficiently well preserved to suggest that it might have proliferated, although it may rarely or never do so, as Berengrün held regarding epithelial remnants in the palate.

The presence of a small cyst 2 mm. in diameter in the wall of the cavity reported by Congdon is extremely interesting, and might seem to suggest the occurrence of mucous glands in the cyst wall. It seems more likely that this small intramural cyst arose from epithelial remnants which lay in juxtaposition to the epithelial mass from which the larger cyst developed, and that the two later fused. Turner's case of multilocular cysts also suggests this. Since the epithelial remnants of the incisor region lie so close together, and also so close to the midline, cyst formation one side could easily extend beyond the line of maxillary fusion, a condition which is not unknown in case of the frontal and sphenoidal sinuses, although unusual there, as emphasized by Congdon[27] (1920).

If cysts can form from epithelial remnants in the incisive region and not grow continuously, it would seem to follow that similar cysts undoubtedly can form from the peridental epithelial remnants. This seems to be indicated also by the statement of Hill that the epithelium in granulomas often is arranged in acini and one cannot but wonder whether this arrangement does not itself suggest beginning cyst formation. The mere presence of epithelial remnants in the peridental membrane would seem to imply that the formation of such cysts probably is not uncommon or necessarily related to pulpless teeth or infection. Whether the stimulus to epithelial proliferation does or can come only through infection probably must remain undecided until we know more about cyst formation in other parts of the body. It is pertinent to recall in this connection that it is not held that dentigerous, branchial, ovarian or parovarian and adenoid cysts form as the result of infectious processes although infection may be concerned even here. Anyone especially interested will find a full discussion and extensive literature in the chapter by Römer[28] in Henke and Lubarsch (1928).

Since the foregoing was written, I have received an excellent roentgenogram from

27. Congdon, E. D.: Distribution and Origin of Septa and Walls of Sphenoidal Sinus, Anat. Rec., 18, 1919.

28. Römer: Die Pathologie der Zähne, Handbuch der speziellen pathologischen Anatomie und Histologie, Berlin: Henke and Lubarsch, Vol. 4, Part 2, 1928.

Dr. Sloman, showing a large and characteristic symmetrical shadow in the interincisive region. Dr. Sloman wrote that the patient evidently had vital incisors in this region. Figure 18, made from this roentgenogram, indicates the size and shape of the area very well indeed. It is possible that this shadow was due to a large and deep anterior palatine fossa, but this probably cannot be decided roentgenologically; for whenever a cyst arises in the separate or united incisive canals, or in a very deep anterior palatine fossa, a roentgenogram may be misleading.

Roentgenograms of a second case referred to Dr. Sloman are shown in Figures 19 and 20. The shadow indicated in the interincisive region was thought to be caused by a cyst similar to that at the root of the right central, devitalized incisor, but since Dr. Sloman was familiar with our findings in the incisor region, he rightly questioned that diagnosis. His doubt was confirmed at operation when it was demonstrated that the cyst in the interincisive region did not communicate with the alveolus of either central incisor. It was easily detached at the time of operation, except for a connection with the soft tissues of the palate in the region of the incisive foramen.

The contents of this cyst was a thin, slightly yellowish mucoid fluid which contained insufficient albuminous material to render it visible anywhere except in the immediate neighborhood of the lining epithelium, in microscopic sections. Its wall was composed of a relatively thick layer of quite vascular connective tissue with a few areas suggesting slight lymphocytic infiltration. Polymorphonuclear leukocytes were absent. The most interesting thing was the presence of columnar superimposed on pseudostratified epithelium, in some areas. In other areas, the epithelium was pseudostratified, containing many layers of cells, and, in still others, there was only a single layer of closely apposed, elongated nuclei parallel to the inner surface. The greater portion of the inner wall was without a lining epithelium. Although neither cilia nor a brush border was evident on the columnar epithelium, the individual cells were quite distinct in some areas, although the distal portions were degenerate or covered with a lightly staining coagulum in others.

I do not think it probable that a portion of the lining epithelium was lost when the cyst was opened slightly during its removal. Had this been the case, one would have expected to find portions of detached epithelium present in its cavity. It would seem more likely that the lining epithelium underwent degeneration and complete lysis in some places during life and that the presence of columnar epithelium was due to metastasis of the superficial layer of the original squamous epithelium.

The structure and contents of the root cyst were similar except for the absence of a definite epithelial lining and the presence of marked infiltration and some edema. This cyst, too, contained evidences of necrotic stratified epithelium, which confirms some of the earlier findings on the part of others, and indicates that the epithelial remnants of Malassez undoubtedly were here concerned. It is evident that whenever this epithelium is well preserved and forms an inner lining for a root cyst, and whenever the wall of the latter does not show evidence of chronic irritation, if that is possible, it may be impossible to distinguish a root cyst from one in the incisive canals upon the basis of microscopic examination. This is especially true since, as already

emphasized, infection might be present in both.

The evidence here presented, it seems to me, clearly confirms the occurrence of a type of cyst not directly connected with the teeth, in the interincisive region of the maxilla, and confirms my original belief that they are not abscess cavities. With the finding of other specimens and the extension of our knowledge of the development of the palate, the original suggestion that they may be paranasal sinuses no longer commends itself. Indeed, I had come to this conclusion before the finding of the specimen reported by Congdon, and cautioned against confirmation of my first suggestion by him, in spite of the finding of a columnar epithelium in that case, for I had then concluded that they probably arose from epithelial remnants left from the time of formation of the palate.

POSTSCRIPT

A few days after I had given an address on the foregoing subject at the annual meeting of the Alumni Association of the College of Dentistry of the University of California, B. E. Lischer, of that institution, called my attention to an an article by Schroff.[29] It is a great satisfaction to find that Schroff's clinical cases and his findings so completely confirm my observations in the dissecting room over two decades, the opinion which I expressed at one of the sessions of the American Association of Anatomists in New Haven in 1926, in a brief public discussion with Professor Schaefer; to the Alumni Association of the College of Physicians and Surgeons, San Francisco, almost a year and a half ago, and before a meeting of the Santa Clara County Medical Society shortly thereafter. My colleagues and students, some of both of whom transferred to eastern institutions, and numerous visitors both from at home and abroad who happened to come to our laboratory during the last decade all were familiar with my findings.

I cannot discuss Schroff's significant and very interesting cases in this connection and shall content myself with directing especial attention to the following excerpts from his article: Remnants of the nasopalatine duct are said to be only "occasionally present in humans," but it is nevertheless stated that

> Approximately 2 cm. dorsal to the inner margin of the nostril, and in juxtaposition to the nasal septum, the floor of each nasal fossa presents a slight depression. This depression leads into a small canal, the nasopalatine (incisivus) canal, which is lined with mucosa continuous with that lining the inferior nasal meatus. Each canal courses obliquely forward and with its fellow of the opposite fossa converges toward the nasal septum, descends almost vertically and passes through the Y-shaped incisor foramen (anterior palatine canal) in the hard palate (Fig. 1). The canal terminates in the roof of the mouth as a minute slit at the end of the incisive pad or papilla palatina.

The reader is given the impression that a palatine papilla is constantly present in adults, for it is stated that "on the mucous membrane of the hard palate on the median line, slightly behind the central incisors, is found a spindle or pear-shaped smooth swelling, approximately 2 mm. wide and 3-4 mm. long, called the papilla palatina, which covers the mouth of the incisor canal."

The incisive foramen is said to appear in roentgenograms "faintly or as a distinct oval or round outline, the area within manifesting different degrees of decalcification," although the "area" within contains soft tissues,

29. Schroff, Joseph: J. Dent. Res., 10:739 (Dec.) 1930.

The genesis of these cysts is described as follows:

> The end result of the inflammation of the naso-palatine canal contents is the same, whether brought about by extension from the papilla, or from a dental or nasal infection. The exits or slit-like openings of the canal in the palate are occluded, and the inflammatory secretions are confined within a more or less closed space. The pressure of the accumulating secretions is manifested by the tumor formation in the region of the papilla. When the occlusion of the normal openings is temporary, or intervention is affected by simple probing into the mass, or when suction by the tongue against the mass is sufficient to form an exit for the secretions, the swelling may disappear after a time. However, unless the etiologic factors are eliminated, the swelling recurs. On the other hand, when permanent occlusion of the normal openings into the palate occurs, as a result of the inflammatory process, the accumulating secretions give rise to the retention type of cyst in the nasopalatine canal. . . .
>
> The father's history of a similar occurrence seems to corroborate its congenital nature. . . .
>
> Palpation disclosed that the palatal bone in the premaxillary region was absent. . . .
>
> Enlarged incisor foramina, in the absence of symptoms, indicate that drainage of secretions is effectual.

SIGNIFICANCE OF LEUKOPLAKIA*

By M. MONTE BETTMAN, D.M.D., Portland, Ore.

PERIODONTIA is concerned essentially with the supporting tissues of the teeth, but the periodontist, as well as the general practitioner of dentistry, should be familiar with the pathology of the entire oral cavity and should always be on the alert and able to recognize immediately any deviation from the normal, either in appearance or in structure.

With this thought in mind, I shall review a condition that is not essentially a part of our specialty, yet the early recognition of which is of the greatest importance to the welfare of the patient, and the consequent neglect of which may be the cause of much unnecessary suffering and early death.

Leukoplakia, or smoker's patch as it is sometimes called, is more common than is generally thought, and the dentist, no matter what branch of the profession he may practice, should recognize it early. The dentist is often the first and many times the only practitioner of the healing art who is given an opportunity to see the patient at more or less frequent intervals.

Leukoplakia is a disease of adults. It occurs usually in middle age. It is characterized in the early stages by a pearly white glistening patch or patches on the mucous membrane of the cheeks, palate or tongue. As the disease progresses, these patches thicken, harden and become hornified, presenting a leathery feel when palpated. Often, the mouth will give the appearance of having been burned with phenol. The patient is aware of no pain nor discomfort, and unless recognized by the dentist, the leukoplakia may be allowed to progress to the stage where the patches crack and ulcerate. At this time,

*Read before the American Academy of Periodontology, Colorado Springs, Colo., July 18, 1930.

it becomes painful and is a real menace to the health of the patient.

The etiology of leukoplakia has been more or less a mooted question. Some writers claim that it is always preceded by syphilis, while others deny this. Stein says, "Although there is no doubt that leukoplakia is not exclusively a syphilitic lesion, nevertheless there is also no doubt that syphilis predetermines conditions for its occurrence and an especially high percentage of those who suffer from leukoplakia are syphilitic." Fox says,

The question of the relationship of syphilis to leukoplakia has been the cause of much difference of opinion. The contention is that syphilis acts in some unknown manner as a predisposing cause to the formation of leukoplakia. That leukoplakia is not a direct syph-

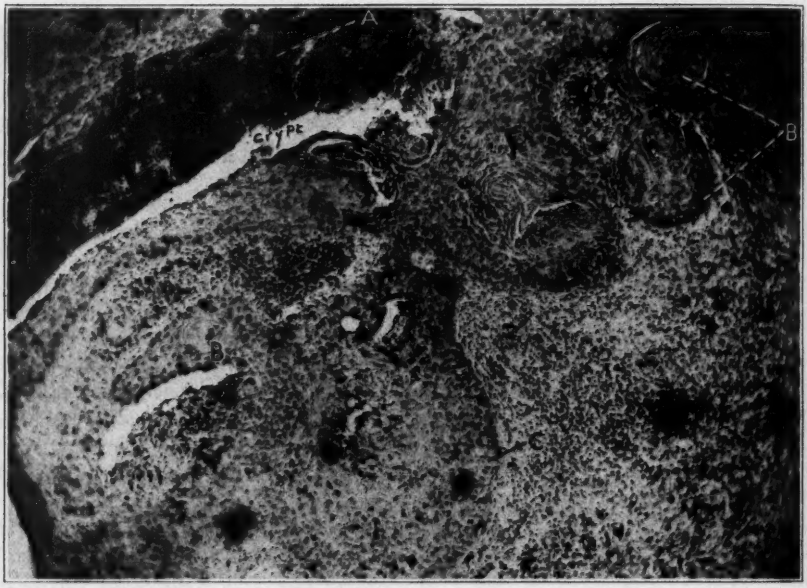


Fig. 1.—Microscopic section revealing the presence of overgrowth of epithelium in association with definite lymphoid accumulations (*A*). The epithelium, which is hyperplastic and hypertrophic, extends to a variable depth into the underlying tissue. The chromatin in the nuclei is increased, many of them appearing almost solidly black. In these extensions of cell masses into the underlying tissue (*C*), numerous mitotic figures indicating marked hyperplasia are also seen. Definite epithelial pearls (*B*) are to be seen removed from the epithelial structure in the defensive zone or within the broad extending plaques of epithelium. While there is an irregularity to the depth to which the epithelium extends, the growth is evidently localized. In addition to the distinctive lymphoid structures mentioned, there is a rather dense round-cell infiltration all about the peripheries of the extending cell growth. This so-called round-cell infiltration consists of plasma cells, eosinophils, polymorphonuclear leukocytes and endothelial leukocytes. These cell groups lie in an edematous supportive stroma. Attention is called to the occurrence of crypts and the relationship of epithelium to lymphoid tissue; a relationship that is often maintained in metastatic growth in the cervical lymph nodes, even when the growth is primary in the mouth or nasopharynx. (Compare Fig. 2.)

ilitic manifestation is evident from its histologic structure, and its failure to be influenced by antisyphilitic treatment. The essential pathologic process is a hyperkeratinization of the mucosa and a gradual sclerosis of the derma—changes that are not characteristic of syphilis. There is a mass of evidence in literature showing that leukoplakia is preceded in a large portion of cases by syphilitic infection. The statistics of Fournier show that of 324 patients suffering from leukoplakia, 80 per cent had previously been infected with syphilis and in the remaining 20 per cent this disease could not be absolutely excluded. On the other hand, Max Joseph found a much smaller percentage—35.2 per cent in 100 cases of leukoplakia.

It would appear from the foregoing that the relationship between leukoplakia and syphilis is very close, but many other cases reported give proof that the former occurs frequently without association with the latter disease.

Hazen and Eichenlaub consider that "syphilis represents an accidental rather than a causative factor in this disease." They report that at least 70 per cent of their cases could probably be attributed to nonsyphilitic conditions. Raillet comes to the conclusion from the study of a large series of cases that, in at least 15 per cent of his cases, syphilis in any form could not be held responsible. Brophy says that leukoplakia is due principally to the use of tobacco, and in Shoengart's record of 596 cases of this disease, there were 586 men afflicted—all smokers.

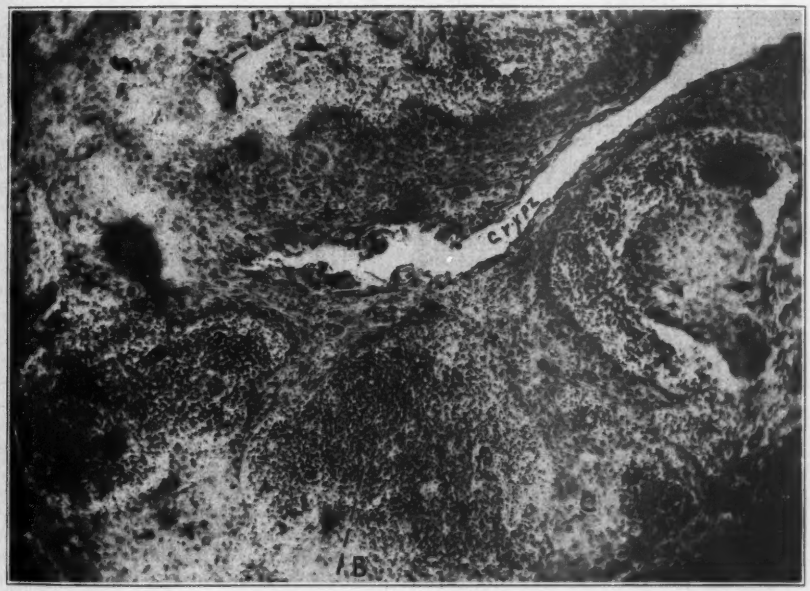


Fig. 2.—Microscopic section revealing presence of overgrowth of epithelium in association with definite lymphoid accumulations (*B*); cell masses extending into underlying tissue (*C*); epithelial pearls removed from epithelial structure (*D*). (Compare Fig. 2.)

It is my opinion, based upon a limited number of cases which have come under my observation, that the excessive use of tobacco is the most frequent primary etiologic factor in the disease. I have never seen a case of leukoplakia in a patient who has not used tobacco; on the other hand, the Wassermann reaction has been of no significance. Joseph agrees with this opinion when he states that "the severity of leukoplakia depends on the greater or less use of tobacco." Bloodgood states that all his cases of leukoplakia give a definite history of the excessive use of tobacco.

According to Henry Pelouze DeForest,

The principal cause is undoubtedly the smoking of many and strong cigars or cigarets, or the use of tobacco in short-stemmed pipes. The nicotine of the tobacco is not the only cause but the combination products of the tobacco, such as: carbonic acid gas, ammonia, and creosote. This fact accounts for the much greater preponderance of leukoplakia in men than in women, for it has been observed that in those countries where women also smoke to excess, leukoplakia occurs equally in both sexes.

This seems to be especially so in those countries in which women are large users of cigars and pipe tobacco. Cigaret smoking, according to Prinz, carries with it the least element of danger. He states that twenty cigarets consume about as much tobacco as two cigars and that pipe smoking is the most harmful of the tobacco habits.

The prognosis of leukoplakia is favorable so long as the patches do not show a tendency to split or crack. The moment this occurs, the lesion is likely to take on a malignant aspect. Bloodgood considers that leukoplakia is second only to bad teeth as a cause of cancer of the mouth. He found that in 160 cases of cancer of the tongue in men, leukoplakia had been present in forty-one cases, and known to the patient for years.

Little can be done in the way of treatment for leukoplakia. Numerous methods of treatment, based principally on the part played by syphilis in its causation, have been tried in the past, but it has been proved that these treatments have had little or no effect. The most effective treatment at the present time, and one which should be instituted at the first signs of trouble, is the elimination, as far as is possible, of all local irritation. Thorough prophylaxis is of the utmost importance and the use of tobacco in every form, as well as all spicy and very hot or irritating foods, should be prohibited.

I have seen gratifying results from this treatment, the leukoplakia spots gradually disappearing, provided they have not been of too long standing.

The following case which came under my observation will show the significance of leukoplakia.

REPORT OF CASE

Mr. L., attorney, aged 46, came in January 16, complaining of soreness in the region of the right upper third molar. On examination, an almost universal leukoplakia of the mouth, including tongue, gums and palate, was revealed. The mucous membrane presented a cooked and whitened appearance. The right upper third molar was very loose and, on the lingual gingiva, was an ulcerated area about the size of a small pea. The patient gave a history of having had white patches in his mouth for several years. During the past four years, his family dentist had told him repeatedly that his gums looked "cooked," but he gave the patient no advice concerning the condition and stated that it was of no consequence.

The patient had been a constant user of tobacco in all its forms since boyhood.

The loose third molar was picked out and instructions were given to discontinue immediately the use of tobacco and all spicy substances. The patient obeyed. The next day, he was given a prophylactic treatment and, as the ulcerated area looked suspicious, was referred to a surgeon for confirmation of a

tentative diagnosis of carcinoma. Diagnosis was not confirmed at this time.

February 24, the leukoplakia was apparently unchanged, but the lingual tissue in the right upper third molar region showed an ulcerated area about one-fourth inch in diameter and presented a cauliflower appearance. The diagnosis being still in question, a section was clipped off for microscopic examination. This revealed "squamous-cell carcinoma of a high degree of malignancy, with infiltration evidently advanced below the depth of the incision."

The patient stated that he had not had any venereal disease and gave a history of perfect health, never having required the services of a physician since childhood. The Wassermann reaction was negative in all antigens. The blood count was entirely within normal limits. Roentgen-ray examination showed that the left antrum and the left and right ethmoidal cells were clear, but the right antrum was apparently completely filled.

The surgeons decided to give two intensive roentgen-ray treatments and, after a wait of three days, they resorted to surgical measures, March 6. Operation consisted of the dissection of the submaxillary triangle, removal of the submaxillary gland and three enlarged lymphatic nodes and ligation of the external carotid artery.

The right upper molars and bicuspids were then removed, after cauterization of the local lesion. The alveolar process was removed, the antrum being exposed through the floor. The antrum was found to be packed full of soft, friable carcinomatous tissues. This was removed with a curet and the entire cavity then thoroughly cauterized with one soldering iron after another at black heat.

A denture was made April 20, by a prosthetist, and, May 6, a scraping from the area, which again looked suspicious, showed microscopically stratified squamous-cell carcinoma.

The patient was then treated at intervals with radium and roentgen rays. The case resulted fatally about eight months after surgical interference.

Dr. Bloodgood, who saw the patient shortly after the operation, stated that, in about a hundred cases of this type, in which operation was performed, he had not saved one patient.

CONCLUSION

Let me reiterate that the periodontist as well as the general practitioner of dentistry should be ever on the watch for any signs of leukoplakia, and when they are seen, the patient should be advised to discontinue the use of all irritating substances, especially tobacco. The only hope for the prevention of malignancy in leukoplakia is the early recognition and prevention of further irritation.

Mayer Building.

DISCUSSION

Arthur H. Merritt, New York City: I should like to ask Dr. Bettman whether, in his observation of these cases, he has had any difficulty regarding cooperation of physician and patient. I have seen many of these cases and take them more or less seriously, always advising the patient what ought to be done, but, in most instances, I find the patient unwilling to cooperate, and when I have asked for the cooperation of the family physician, I frequently find the physician also not taking it seriously. I have in mind now a patient, a judge in one of our courts in New York, a man in the sixties, an excessive smoker, with, throughout the entire oral mucous membrane, that parboiled appearance which is so characteristic of the excessive smoker, plus several areas of a leathery appearance. I succeeded in getting him to see his physician, he later reporting to me that the physician had said, "Oh, well, you can't take that seriously. Perhaps you had better let up a little while." He has continued smoking as far as I have been able to observe. Another case is that of a cigaret smoker. I asked him how many cigarets he smoked and he said, "I smoke once a day, from the time I get up until I go to bed." His mouth was in such condition that again I advised him not to smoke. I knew his family physician, and I got in touch with him and he advised the patient to discontinue smoking, which he did. I saw this man in my office within the last month, when he reminded me that he had not smoked once in fourteen years. His mouth had entirely cleared up. The mucus membrane of his mouth was as healthy looking as that of a child, although he had had throughout the entire oral cavity marked evidence of excessive smoking. He told me also that he knew he had been affected physically from his smoking. He was strong, and vigorous, a man who prided himself on his

strength and athletic attributes. He said, "I discovered within six months after I had discontinued smoking how greatly I had improved in health. I know of nothing on the face of this earth that could induce me to return to smoking. I have not smoked as much as a cigaret in fourteen years." Another case which came under my observation two years ago last June was that of a man who was sent to me by his dentist, and who had an even more marked condition, in the sense of that leathery, hornified appearance, the type characteristic of the advanced case. He told me that he smoked on an average of twelve cigars a day. When I looked his mouth over, I said to him, "You should discontinue your smoking. There is no other treatment that you can have that I know of which will affect this condition favorably." As he left the office, he said, "I swore off five minutes ago. I am not going to smoke any more." I saw him a little less than a year after that, and about half to two-thirds of the oral area had already cleared up without any treatment at all. I believe that Dr. Bettman has done a real service in calling the attention of members of the Academy to a lesion much more common than I think we generally realize and one which should be taken much more seriously than we generally take it. I have never found it in the mouth of a nonsmoker. Regarding syphilitic patients, I think we have overestimated the importance of syphilis as an etiologic factor in these cases, because we find in almost every instance that the syphilitic patient is an excessive smoker. I have in mind now a patient of that type. He had acquired syphilis thirty-five years ago and had been cured, but in all those years has smoked more or less to excess. He has marked leukoplakia, including the fissures of the lips, the inside of his lips and the oral mucous membrane. He has never been willing to discontinue smoking. At times, he goes to a well-known dermatologist of the city for some treatments because these lip fissures bother him, but he goes on smoking. I think that we should be more alert than we are. We ought to consider it an unfavorable factor in our periodontic treatment, just as excessive smoking in many cases affects the prognosis in cases of periodontoclasia.

Wilhelmina Yeretsky, Grand Rapids, Mich.: I should like to ask Dr. Bettman, assuming that it is impossible to get a man to stop smoking, if the use of radium is indicated in these cases.

Clayton H. Gracey, Detroit, Mich.: I should like to have Dr. Bettman's advice in the following case. A man came in some time ago with chronic leukoplakia, and casting about for some method to treat it, aside from those mild suggestions that we have been given by various men who have looked into this matter, I bethought myself of Dr. McCall's sodium sulphid. I took a patch of this mucous membrane immediately distally of the upper right cuspid, which was particularly pronounced, cut through the epithelial tissue, developed a very definite hemorrhage, and followed with the Kromayer lamp. My first experience was so gratifying that I treated another patch a little later on, and I have worked in this mouth now for a period of several weeks, and I am quite encouraged with the results that I have obtained. My reason for using the quartz lamp was to regenerate normal epithelial cells. I have been using the quartz lamp for several years with rather unfavorable results, but I found that, in certain isolated cases, it is very dependable. I should like to ask Dr. Bettman's opinion on this treatment, if he thinks there is any possibility of arriving at anything permanent. I have not treated the case long enough to determine, but I am encouraged, and although I have had, over a period of two or three weeks, a very slight whitish regeneration of this leukoplakia, the mouth as a whole is very much improved, so much so that the patient himself, who had been quite discouraged, is very happy.

Dr. Bettman: Answering Dr. Merritt's question regarding cooperation of physician and patient: I have had the same experience that he has had. It is sometimes difficult to get cooperation between the periodontist and physician, although I have had very marked cooperation and marked results. In the case that I reported, the man was a very high type and well educated. When I told him he had leukoplakia and he should discontinue smoking entirely, he immediately took it to heart. He said that he was through. The next day, he came back and said, "Well, Doctor, I went to the library and looked up leukoplakia. I found out that about 30 per cent of the cases result in cancer. I am certainly not going to smoke any more." In regard to the physicians, I sent him over to two of our best surgeons. I called them up

and told them what I thought. They called me back later and said, "That is nothing but a little granulation tissue." That was all the cooperation that I received from them until I took it on myself to have a section made, and of course when I received the microscopic findings, I called one of the surgeons and told him the results. Then he became interested. Up to that time, I had had no cooperation from these surgeons at all. Regarding cigaret smoking being less harmful than other forms of tobacco, that was merely a quotation. Personally, I think cigaret smoking is dangerous because the average smoker smokes twenty or thirty cigarets a day. Dr. Yeretsky asked about the use of radium. It seems to be the consensus of opinion, as far as I can learn, that radium has little or no effect. We had a case that the surgeon suggested treating with radium. I do not think that it is necessary to use radium. If smoking is discontinued, the case will come out all right. I do not think radium therapy would check the condition if the primary cause continues. I am convinced that tobacco is the primary cause of most of these cases. Regarding the treatment suggested by Dr. Gracey, I know nothing about that. I do not think that it would have any effect. Many things have been recommended. For instance, some of the older remedies had been applied to the mouth while I was waiting for the cooperation of the surgeon, and they had no effect at all.

THE CALLAHAN METHOD OF ROOT FILLING*

By HARRY B. JOHNSTON, D.D.S., Atlanta, Ga.

I SHALL not attempt to give a history of either Dr. Callahan or his method of root filling. Not that I do not think that it would be most timely as a tribute to Dr. Callahan, but because I think that before many more years have passed, an abler pen than mine will do more complete justice to him and the legacy he left the profession in his carefully worked out method, whereby the canals of any tooth, no matter what their size, shape or direction may be successfully filled and permanently sealed at all their external openings.

I wish to pause for a moment to pay tribute to certain of your Chicago men who have apparently approached the problem of the pulpless tooth without prejudice or bias, and have sounded a clear note of reason and sanity on this subject which has made itself heard above the clamorous discord of those who would apparently ascribe all human ills to this much maligned member. I refer particularly among the medical men to Drs. Miller and Hatton, and among the dentists to Drs. Blainey and Coolidge. The wave of hysteria which has recently swept the country, emanating mainly from medical sources, has definitely begun to subside, and with such leadership as you men of Chicago have always given us, may be expected within a reasonable time to reach the normal bounds of clinical experience and sound deductions.

For many years, the profession has been vainly seeking a fool-proof method of perfectly sealing root canals. As illogical as this search is, it will probably go on indefinitely, like the search for the Holy Grail, but with equally barren results. It is only reasonable to believe that at least as far as concerns the pos-

*Read before the Section on Operative Dentistry at the Midwinter Clinic of the Chicago Dental Society, Feb. 3, 1931.

terior teeth, this will remain the most difficult operation in dentistry; which simply means that these teeth at least must be handled by those who are thoroughly trained and experienced in this work. The general practitioner can never, in my opinion, hope for a method which will enable him to cope successfully with canals of the second and third molars, and frequently all of the skill of the specialist is not sufficient to enable him to deal with some of the anterior teeth. Not only is a broad knowledge of pulp canal anatomy necessary, but also a very highly specialized sense of touch must be developed to enable one to penetrate the difficult, tortuous and constricted canals.

Fig. 1.—Schematic drawing showing crevice-like constriction of sides of canal filled with débris which cannot be removed except by chemical means.

Naturally, before the canal can be filled, it must be opened; and before it can be opened, it must be penetrated with the opening instrument. That is the most difficult and the all important part of the operation. I am not speaking of the anterior teeth with the large canals and straight roots—we expect senior students to handle these properly—but of the difficult canals sometimes found in the bicuspids and often in the molars. The true practitioner of the Callahan method does not bar any tooth, no matter what the shape of its roots or its position in the mouth. The beginner starts with the anterior teeth and, as his skill increases, extends the field of his operation until the upper third molars hold no terrors for him unless very abnormal in shape. And even of these, many are surprisingly easy when hopefully approached.

OBLIGATION OF THE PROFESSION

A method of root filling which does not hold out to the patient a reasonable expectation of success of any tooth gives "short measure," and it is unworthy of our research men to offer us such a method without apology for its limited application. The profession is not looking for a method whereby it will be possible to fill successfully the canals of a few selected teeth of the straight rooted type, but for one with which any canal

Fig. 2.—Drawing showing the flattened and curved mesiobuccal canal of upper molar and impracticability of filling or reaming until all débris can be so removed. The lower drawing shows the usual extent of the filling. The acid solution, followed by the soda, effectively boils out this débris.

of any size or shape, with any number of foramina, can be filled and hermetically sealed. I do not claim that this is 100 per cent true of the Callahan method, but I do claim that it is not less than 90 per cent true. By this method, the crooked roots of a third molar can be as successfully filled as the straight root of a central incisor. It is true that the opening of the extremely curved canals is more difficult, but, once opened, they can be filled with equal facility. Often, the retention of an isolated third molar with an exposed pulp, or apically infected, would be of inestimable value to the patient. Are we to admit to our patients that we cannot deal with these because of their curved canals, or their

Fig. 3.—Upper bicuspid showing large lateral canal with apparently an area of infection around it, but no observable area at apex.

inaccessibility? Does the surgeon surrender when a difficult case in bronchoscopy arises; or has medicine surrendered to cancer? By no means. It is true that those cases make a greater demand, for there immediate or early death threatens; on the other hand, thousands of our patients have years taken from their lives by the loss of their natural, efficient masticating mechanism and the substitution therefor of some abomination in the shape of a plate or bridge.

Does the surgeon lightly sacrifice the finger of a patient? Not if he has the true professional mind. Yet the loss of a third or fourth finger would in no way shorten the life of a patient, and the loss of an infected cuspid or isolated second or third molar may make the difference between comfortable, efficient mastication, and discomfort, aggravation and from 50 to 75 per cent efficiency loss. When this added burden is suddenly thrust on one on whom the troubles and harrassments of age are already accumulating, a corresponding percentage of peace, happiness and health, as well as months or years, may be deducted from their lives. The dentist who does not place a high value on at least the masticating teeth of his patients, places a low

Fig. 4.—Upper central incisor showing three or four lateral canals just below midroot. There is rarefaction of alveolar bone around these but none at the apical foramen. Such canals can be filled and sealed only by the Callahan method.

value on their health, efficiency and length of years.

A DESTRUCTIVE PROFESSION

Of all the professions on the face of the globe, save one, dentistry is the most destructive; the one exception is that of the professional housewrecker. (I am speaking of the profession by and large and not of those comparatively few rare souls who still value the teeth of their patients and fight for them to the last

ditch.) The airy lightness with which the vast majority of our profession, and of the medical profession, condemn the teeth of their patients to extraction is appalling. The frequency with which this is done for the simple reason that it is the easiest way out, and to enable the operator to place a highly profitable plate or piece of bridgework, may be unbelievable to those who have not investigated. Dentistry will never stand on its proper plane until practice of this sort has been eliminated. The extraction of a tooth of normal shape and position is one of the easiest of the surgical operations, but the relief of a pathologic condition without the destruction of the parts involved is a real professional service; and not until we render to our patients the professional service to which they are entitled will we overcome that "inferiority complex" which many of our members manifest in the presence of a doctor of medicine. Then, but not before, may we properly claim to stand on a parity with the medical profession.

Fig. 5.—Lateral canal at midroot, to foramen on distal surface of mesial root. Such canals are easily filled and sealed by the Callahan method.

How many of us have constantly in mind the fact that the teeth are true organs of digestion, and that the digestive system is not complete without a full complement of natural teeth? Particularly is it damaged by the loss of the natural molars, for without these one must either resort to unnatural, highly refined, overcooked foods which have had the vitamins destroyed by heat, or must ingest them without their having been prepared for digestion by mastication, as man's digestive apparatus requires. In either event, the patient is in sad case, as serious malnutrition is sure to result and physical well-being, happiness and length of life be proportionately reduced. It has been truly said that man should never swallow anything "thicker than pea soup." No matter what the consistency of the food when it enters the mouth, it should enter the stomach as soup. This requires an excellent masticating apparatus, for this end cannot be accomplished with complete or partial plates or removable bridgework.

PREPARATION FOR TREATMENT

The preparation of the tooth for the treatment of the canals should be the same in all methods of canal opening and filling; i. e., the tooth should be thoroughly cleaned of all deposits, débris and carious dentin before the dam is adjusted. After the dam is placed, the tooth, dam and clamp should be thoroughly scrubbed with tincture of iodin, then with 70 per cent alcohol. By means of sterile burs, the pulp chamber is now freely opened in a manner to allow direct access to each canal. The less expert operator will require a larger opening. Open it to your own satisfaction. It is better to cut away an entire mesiobuccal cusp than to lose the tooth. The finest pointed stone, through the enamel, followed with a No. 3 bur through the dentin will give as free access as I require for an anterior tooth; a No. 4 for the biscupids, and a No. 6 or 8 for the molars, except the third molars. Rules do not apply to third molars, particularly the upper.

TECHNIC

The technic of the Callahan method calls for the use of a 30 per cent solution of chemically pure sulphuric acid in distilled water in the opening and cleaning of the canals. This is used in conjunction with instrumentation, the canal being flooded with this solution while being smoothed and enlarged with such instruments as the operator may prefer. This is followed by a saturated solution of sodium bicarbonate to neutralize the acid, and that the resulting effervescence may blow out the débris loosened by the instruments and acid. This is repeated until all débris is removed, the walls are smoothed and the diameter of the canal is enlarged to the operator's liking. After the last neutralization of the acid, the canal is dried with absorbent points and pure grain alcohol is pumped to the apex. This is also removed with absorbent points and a hot root-canal drier. (I have dispensed with a root-canal drier, for reasons which I will give later.) The canal is now filled with a solution of chemically pure chloroform and the purest pine resin in the approximate proportions of 12 grains of resin to 3 fluid drams of chloroform. This is carried to the apex with instruments or absorbent points. A guttapercha point of suitable size, composed of pure baseplate guttapercha, is immediately introduced into the canal, carried to the apex and dissolved with a gentle pumping motion. This is continued until all the guttapercha that the chloroform can be forced to soften has been carried in. Now, the remaining solid guttapercha is softened with a current of hot air, and the mass in the canal is thoroughly condensed with root-canal pluggers, care being exercised, of course, not to force more than a small bead of excess through the apex. The pulp chamber is then immediately filled with cement, and the case is roentgenrayed from such angles as may be necessary, in order to prove all canals filled.

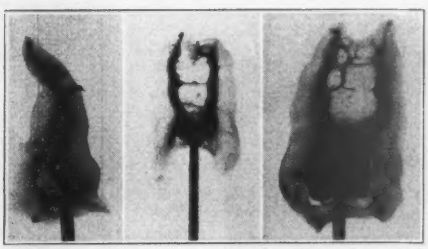


Fig. 6.—Left: Decalcified specimen showing trunk foramen at about midroot and only two small accessory foramina at apex. Failure to meet such conditions accounts for loss of many valuable teeth. Center: Decalicified specimen showing bifurcation of mesiobuccal canal near apex, numerous nutrient and one large communicating canal, all successfully filled by Callahan method. Right: Decalcified specimen, fused mesiobuccal and palatal roots, showing intricate canal system and numerous foramina, successfully filled.

There are, of course, one or more reasons for each of these steps, and we will now consider these in their natural order.

Sulphuric Acid for Cleaning.—Dr. Callahan contended that it is a practical impossibility to really clean the canal walls of the average tooth except by chemical means. I am convinced that this contention is supported by fact. It is ad-

mitted by students of dental anatomy that a canal which is perfectly round throughout its entire length, or even any considerable portion of its length, is an anatomic accident. This being the case, even the incisors and cuspids cannot be cleaned with round instruments unless their canals are enlarged sufficiently to render them practically or entirely round. Even when this is done, the canal walls cannot be perfectly cleaned of the scrapings, fillings or débris from grinding, except by chemical means, or by being enlarged sufficiently to permit an air or water syringe to be introduced to the proposed limit of the filling and such débris forcibly blown out; and this would be impractical, unnecessary and dangerous.

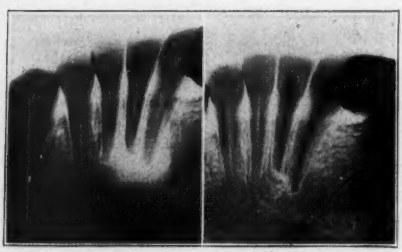


Fig. 7.—Result accomplished by proper electrosterilization and root-filling methods. One year elapsed between the two pictures. There is no sclerotic bone.

After passing the cuspids and getting into the bicuspids and molars, the difficulty of mechanical cleansing becomes even more nearly impossible. The canals become broader and flatter, the roots more curved, rendering reaming out of the question. The mesiobuccal canals of the molars are so broad and so flat that even if they were straight, they could not be reamed into rounded form without perforating the side.

There is much theoretic objection to the use of sulphuric acid, but this is due either to its abuse, or to a lack of accurate knowledge as to its action. Only by the grossest overinstrumentation can any of the acid be carried through the canal. If the instrument is passed entirely through the canal and into the apical tissues, the acid on the instrument will be wiped off by the tissues and retained, but free acid, that is, acid not attached to the file or broach, will not be forced through. This is contrary to what seems to be the popular conception, but is perfectly true. Remember, 30 per cent sulphuric will not diffuse into tissue, but should it come in contact with tissue, quickly forms a thin coagulum which completely bars its further progress. This applies also to its penetration of dentin, for there it converts the surface calcium into calcium sulphate, which is insoluble, and thereby limits its action to the area being curetted by the operator.

Fig. 8.—Aggravated case. Pus flowed from five fistulas on the labial gum. The central incisor was vital, but the central and lateral incisors were both very loose. One electrosterilization treatment was given and the canal was filled immediately.

Hydrochloric acid is not self-limiting in dentin, and as it does not effervesce on addition of soda, it is both inferior in

action and more dangerous to tooth structure.

The action of sulphuric not only makes easier the task of enlarging the canal, but it also burns, or chars, and shrinks any organic débris present, causing its adhesion to the canal wall to be weakened, dissolves any clots, sterilizes putrescent material, and then, on the addition of sodium bicarbonate, breaks up and violently expels all foreign material from the canal. By the mechanical method, if there are accessory canals present they are practically sure to become plugged up by the continual churning around of the débris, which renders their subsequent filling a practical impossibility. On the other hand, the acid diffuses readily into this dead material, and saturates it so that it can be blown apart and expelled from the canal on the addition of the soda. The canals are then left free, open and clean and can be readily filled, as I will endeavor to show. Who would be so bold as to say that it is not just as necessary to fill even the smallest of these accessory canals as it is to fill the main canal? I could show you many cases in which there is no evidence whatsoever of a pathologic process around the main foramen, but a well-defined area around the foramen of a lateral, or accessory, canal. So much for the elements of safety and necessity in the use of the acid. Fourteen years' experience has convinced me that when the least soreness or apical irritation follows its use, it is because of my clumsiness or lack of care.

Fig. 9.—Case shown in Figure 8; two years later. There is perfect regeneration of alveolar bone (not sclerotic) and reattachment of periodontium, and the central incisor is vital.

After the acid and soda comes the alcohol, and it is at this stage that I have made a slight change in the Callahan method. Dr. Callahan advocated the use of the hot canal driers to completely dehydrate the canals, but in my opinion this is the one weakness in his method. I have found, from several years' experimentation and years of experience, that when the alcohol is dried out of the fine crevices and accessory canals, we can rarely induce the guttapercha to enter them. This is because the chloroform does not enter them, and where the chloroform does not go, the guttapercha will not go. As the chloroform is pumped into the main canal, it imprisons in these fine canals and crevices, minute air bubbles which plug them up and prevent the entrance of either chloroform or guttapercha. These cannot be successfully pressed out by condensing the root-filling, because, in the crevices, there is no escape for them, and, in the canals, their only

Fig. 10.—Schematic drawing showing filling perfectly made to dentinocemental junction. Efforts to fill the two lateral canals failed and there was no bead to bind the root filling to the apex.

exit would be into the tissues, which would not be an advisable alternative. If, instead of driving the alcohol out of these small spaces, we allow it to remain in them by using only absorbent points to dry out the main canal, when we pump in the chloroform solution, the chloroform on coming in contact with the alcohol, absorbs it, and diffuses it into the accessory canals, having, as it does, a great affinity for alcohol. We then have our main canal and all crevices and accessory canals filled with a chloroform-resin solution instead of air. Guttapercha has a great affinity for chloroform and absorbs it rapidly. As the absorption of the chloroform takes place, something must take its place, and as the only available substance is the guttapercha, this

Fig. 11.—Schematic drawing showing filling seen in Figure 10; from three to six months later. Shrinkage has taken place from the apex toward the gingiva (from lesser bulk toward the greater), and practically the entire canal is easily permeable to the tissue fluids.

works into the accessory canals in sufficient density to accomplish an actual filling and sealing of the canal if it is anchored in place by a bead of guttapercha just beyond the foramen.

WHY PINE RESIN IN THE CHLOROFORM?

The next point for explanation and defense in this method would probably be the use of the pine resin in the chloroform. Just as chloroform is naturally sterile, so is pine resin, but the latter is an active as well as a passive germicide; active because of its inherent chemical properties, and passive because of its ability to fix the bacteria physically by encapsulation when it solidifies. Even the spore formers or spores cannot proliferate while encased in a solid and insoluble coating of resin. Furthermore, it freely enters the tubuli clear to the dentinocemental junction, physically obliterates them and renders the passage of toxins either inwardly or outwardly practically impossible. It also serves the purpose of lowering the shrinkage ratio of the guttapercha. (The one great weakness of this material as a root filling.) It does this to a marked extent by filling the pores, or intermolecular spaces. This serves also to harden it, and to destroy

Fig. 12.—Anchored filling immediately after being placed.

even its limited ability to absorb toxins, either liquid or gaseous. No valid objection to its use has ever been brought forward, to my knowledge, and in view of its very apparent beneficent qualities, the wisdom of its use is apparently vindicated. Dr. Callahan advocated its use for what seems to me to be one of its minor qualities, its adhesiveness, which permits it to bind the filling to the canal wall. This it cannot do except to a limited extent, but the other purposes it serves far transcend the importance of this one. One reason some operators have condemned its use is that they have permitted their solution to become too thick

by evaporation and therefore, having a great excess of resin, it defeats some of the very purposes which it is supposed to accomplish. The chloroform should not be in the least perceptibly thickened by the addition of the resin.

ANCHORING THE FILLING TO THE APEX

Much has been written about the dire sequelae from the slightest trauma of the apical tissues. This is entirely unsupported by clinical evidence. Hardly an issue of a dental journal appears these days that we do not have held up before our eyes by some entirely honest and sincere but misguided soul the frightful consequences of traumatizing the apical tissues. This, they inform us, can ensue from removing the pulp beyond

Fig. 13.—Filling shown in Figure 12; three months or more later; showing shrinkage of entire filling and beads. Small beads of excess beyond each foramen force the shrinkage to take place from the gingiva toward the apex, creating an elastic tension between the extremes of the filling and wedging the beads tightly into the foramen.

the dentinocemental junction (wherever that may be); instrumentation beyond the dentinocemental junction; instrumentation beyond the foramen, or the forcing, or otherwise placing, of any material of any sort or nature beyond the foramen. When, and by whom, I would respectfully inquire, has it been found that any organ or tissue of the body will not recover from any reasonable trauma not associated with pathogenic bacteria? Stomachs have been removed and the patients have lived for years after the trauma has been repaired. Intestines have been removed by the yard without apparent damage to the patient. The heart, the lungs, the kidneys, the brain have been successfully operated on thousands of times, to the great benefit of the patient. Bullets, knives, shrapnel, glass, pins, needles, nails and every other variety of foreign substances have been driven into the soft or osseous tissue and remained there, but the patient has lived and prospered and, after a few weeks or months, has been none the worse for it as far as could be perceived. Major arteries have been tied off and the patient has recovered. Trunk nerves have been removed and the patient has lived to a ripe old age. One or both legs have been removed at the hips and the patient has lived to become thereafter, a burden to their family or a charge on the state. We are told by the orthopedist that a simple fracture without displacement of a long bone is a minor matter. Does that produce less trauma than the injection of even a cubic millimeter of sterile and inert guttapercha into the apical tissue? Does not an acute periapical abscess traumatize the tissues? Yet some, apparently, would have us believe that the passing of a sterile instrument into these same tissues is more fraught with danger to the patient. Is that position tenable? Are not the apical and cortical tissues greatly traumatized by the extraction of a tooth? I submit that such is the case. How could you traumatize the apical tissues more severely than to remove them, as is done in an apicoectomy?

I maintain that the position assumed by some of our leaders in regard to apical trauma, and the production of "an area of lowered vital resistance" is absolutely untenable, and I submit it to you for your consideration and decision.

I deny that a bead or button or knob of guttapercha, if sterile, produces any lowered tissue tone or serious trauma or whatnot that the tissues do not quickly adjust themselves to and render entirely harmless by their rapid encapsulation with scar tissue. This is Nature's buffer material, and quickly walls off any sterile and chemically inactive foreign body, thereby protecting the specialized cells which would be irritated by direct contact with such body, but which are not irritated by contact with scar tissue. Guttapercha is a chemically inert substance, and therefore has no tendency to produce persistent inflammation, and roentgenograms, as well as direct examination, show that it is quickly encapsulated without perceptible effect on the surrounding tissue. It is true that scar tissue which forms in the presence of infection will retain some of the bacteria for months or years, but it is also true that this tissue, once it becomes sterile, or having been formed under sterile conditions, is the most resistant tissue in the body to the invasion of bacteria.

This brings me to the final point, the necessity of sealing the canal from the outer end by means of a small bead of guttapercha beyond the apex. The one defect that this material has as a root filling is that it will shrink after being packed into a cavity of any sort, by any means. Pack it into a glass tube or any other transparent receptacle under a stream of air just hot enough to render it plastic, and it will immediately begin to shrink. This will continue over a period of hours even though it be immediately frozen. It is, by present methods, unavoidable; but though we cannot avoid it, we can control it. That is what the bead does.

With guttapercha, as with all other materials, the greatest shrinkage is along the line of greatest diameter, which is in this case from the pulp chamber to the apex. Of course, it also shrinks laterally. Therefore, it can be readily seen that if it is not anchored at the apex, it will draw away from it, or from the dentinocemental junction, leaving both entirely open and susceptible to invasion of bacteria, or infiltration of stagnant blood plasma. Therefore, if we fail in the last step of this tedious and exacting operation, it is questionable that we have accomplished anything beyond the cleaning and sterilizing of the canal, and would it not have been just as well to stop there and leave the entire result to old Mother Nature, in whom we seem to have so little confidence and yet to whose indulgence and protection against bacterial invasion, we owe our lives a thousand times a day.

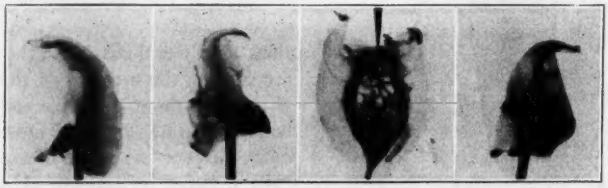


Fig. 14.—Difficult types of canals easily filled by Callahan method, but not usually successfully treated by any other method.

CONCLUSIONS

1. Only by chemical means is it practical to prepare the roots of the posterior teeth properly for the reception of the filling.

2. A 30 per cent solution of sulphuric acid, reasonably used, has no destructive action on either tooth structure or apical tissue.

3. To fill all external root surface openings, the filling must be introduced as a very thin liquid capable of diffusion into the most minute spaces.

4. To be successful, every external opening of the root must be filled.

5. If guttapercha is used, the bead of excess beyond the foramen is indispensable to prevent axial shrinkage of the filling.

6. Guttapercha is chemically inert, and therefore nonirritating, and causes no pathologic processes in the apical tissues, other than the formation of a normal buffer layer of scar tissue.

Candler Building.

IS THE MATTER OF DIET EMPHASIZED SUFFICIENTLY TO DENTAL PERICLASIA PATIENTS?*

By A. W. BRYAN, D.D.S., F.A.C.D., Iowa City, Iowa

AN article on periodontoclasia by Stillman and McCall, published a few years ago in *Dental Items of Interest,* presented a chart of etiologic factors. Being impressed with the comprehensiveness of this chart and desiring to use it in classroom work, I obtained permission for its use from the copyright holders and authors. Dr. McCall advised us to postpone using it until a revised edition was available, as it was expected to be within a short time. The original chart placed dietary conditions among the secondary causes, and we predicted to our classes that the revised list would accord diet a more important position. As a matter of fact, this factor appeared in both the primary and the secondary groups, but still with less emphasis as to its importance than many believe should be given it.

With the great amount of work that has been done in the last decade on the influence of diet on the general well-being of mankind, we are realizing more and more what an important factor it is in obtaining results in the treatment of pathologic oral conditions.

Many years ago, in the early spring of the year, I overheard an elderly man conversing with one of the clerks in a grocery store. This man, who appeared to be at least 65, was as straight as an arrow and looked as sturdy as an oak. "All about us," he said, "people are complaining of being sick, and within their reach are the things that will make them well." He probably did not know what a vitamin was, nor had he a knowledge of the importance of minerals in the maintenance of healthy tissues, but he did know that the fresh green leaves and vegetables that were then growing in the spring sunshine contained something that would supply those things that had been

*Read before the American Academy of Periodontology, Colorado Springs, Colo., July 18, 1930.

missing from the average person's winter diet. He could not give a scientific explanation of what vitamins A, B, C, and D accomplished, but he had a practical knowledge of what was good for him. He knew that the fresh green leaves and roots were more beneficial than sarsaparilla and sassafras tea "to thin his thick blood." This old man may still be seen on the streets and his added years are not telling on him as they do on the average person: he knows what to eat.

and minerals on these tissues. Articles have recently appeared reporting work done by Hanke of the University of Chicago and dealing with the effects of lack of vitamins and minerals on the dental tissues. At the meeting of this body held in Minneapolis, Dr. Hirschfield presented a paper dealing with the occurrence of scurvy in patients observed by him.

Most periodontists believe that many of their cases are definitely linked up with conditions of injury, such as trau-

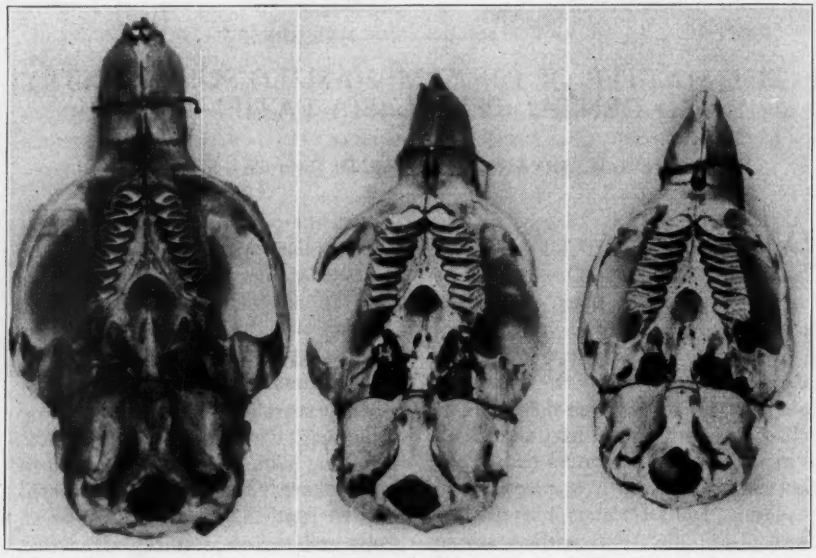


Fig. 1.—Left: Skull of normal guinea-pig. The bone is dense and shiny and the teeth are short. The quality of the bone forming the margins of the sockets is excellent. Center: Skull of pig on a diet of milk and rolled oats. Extensive destruction of bone is indicated by porosity. The teeth are much longer than the normal. The original occlusal facets are present. Right: Skull of pig on diet of milk and whole oats. There is less destruction than the center picture. Because of the rough character of this diet, new facets have been worn on the occlusal surfaces as the teeth moved buccally.

As periodontists, we are dealing directly with two types of tissue, the soft gingiva and bone. Howe, McCollum and others have demonstrated conclusively the effect of the lack of vitamins

matic occlusion, but it seems reasonable to believe also that the same occlusal relations produced no injury to the supporting structures while they were receiving the proper elements of nutrition to main-

tain their integrity. In other words, in these particular cases, it would seem that dietary conditions could be well placed as primary, and traumatic as secondary. And when we come to analyze the dietary habits of our patients, we are led to believe that diet is one of the most important factors to consider in treatment as well as in a study of the etiology.

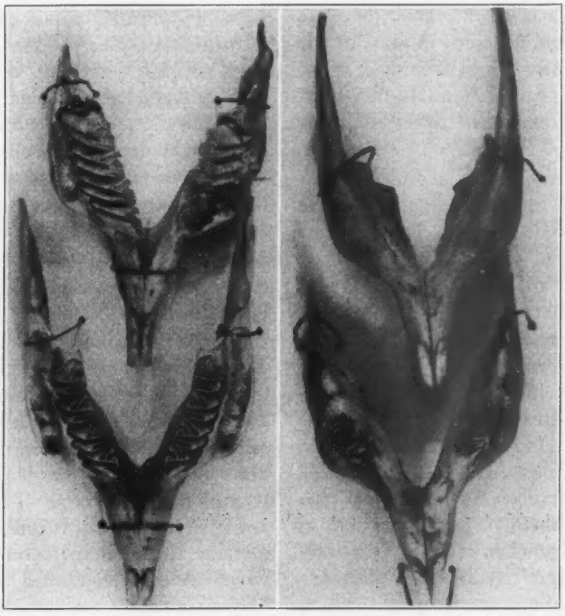


Fig. 2.—Left: Above, mandible of a normal guinea-pig; above, that of guinea-pig on deficiency diet. The difference in length of the teeth and the marked porosity of bone structure in the mandible below are evident. The delicate processes have become paper-thin and badly damaged from handling. Right: Under surfaces of a normal skull (above) and the skull of an animal on a deficiency diet (below). The bony structure has been destroyed on the border of the skull shown below so that the apices of the roots of the teeth show through.

An interesting report was made a few years ago at a meeting of the Waterloo District Dental Society of Iowa by John G. Hilderbrand. An owner of a herd of high-bred dairy cattle had a valuable cow on a milk test. This necessitated keeping her in a stall and forcing her feeding to the limit. After the animal had been on this test for some time, she was found one morning with a broken hip. Because of her value, she was not killed, but was bolstered up in some fashion by the veterinarian and the hip allowed to heal. She was then turned out to pasture until in good condition, after which she was placed on another milk test. But, in a short time, they found her down again with the other hip broken. This time she was ordered killed. The owner said that when the

carcass was removed from the stable, it sounded as if every bone in the body cracked. Out of curiosity they investigated, and found that the bones were completely honeycombed.

It seems reasonable to believe that Nature, in an effort to supply the proper mineral content to the secretions, had found it necessary to draw on the only available calcium supply, the skeleton. As the minerals were not furnished in the food intake, the body suffered. Even if secretion is not being increased, there are other losses and demands in some of the tissues that must be satisfied, and if the diet does not provide minerals, they must be obtained from those tissues holding a reserve supply.

If you have questioned some of your patients with the severe and extensive types of periodontoclasia, you have no doubt wondered where the minerals were coming from to maintain alkalinity of blood and other tissues.

The numerous articles published by Percy R. Howe furnish valuable material for thought when we are considering the treatment of these cases. The work of both Howe and McCollum indicates the serious disturbances produced in capillary circulation when certain vitamins are withheld. They report that in the guinea-pig, when vitamin C is lacking, the capillary circulation in the gingivae breaks down, a condition of swelling and engorgement resulting in these areas. These symptoms closely resemble those seen in many cases of severe gingivitis, as in cases reported by Hirschfield and mentioned in a previous paragraph.

At the same time that these soft tissue changes are occurring, serious disturbances are taking place in the osseous tissues of the jaws. Tooth movement occurs that brings about traumatic occlusion, and rapid destruction of bone follows. I wish to report a feeding experiment with guinea-pigs which clearly illustrates the bony changes occurring from certain deficiency diets. These experiments are not at all original, but are simply repetitions of Dr. Howe's early work with guinea-pigs. They were carried on by O. E. Schlanbusch and me at the University of Iowa College of Dentistry several years ago.

Three groups of pigs were used. The control was fed on those substances which a guinea-pig would eat if left free to roam and choose his food. These consisted of raw vegetables, celery, lettuce, cabbage and grass and plantain cuttings. With this diet, perfect health was apparently maintained, the coats were sleek and the resistance to disease was high.

A second group was given a diet of whole milk and rolled oats, with just an occasional bit of green leaf to keep the experiment from terminating too quickly by death of the animals.

The third group was fed on whole milk and whole oats. Note especially that the two experimental groups were on diets that were identical as far as chemical content was concerned, but quite different as regards the physical characteristics of the material. The rolled oats and the whole oats furnished the same mineral and vitamin factors, the husks, which were not consumed, affording the only difference. The important thing is that those pigs eating the whole oats were obliged to do a great deal more work with their jaws in removing the kernel from the husk, and also in grinding the kernel after it was removed. There was a decided difference in the effect of these two diets on the supporting structures. The group on the soft rolled oats showed a more rapid destruction of the alveolar process than did the group on whole oats. A possible explanation of the cause for

this lies in the fact that, while the blood was deficient in minerals to the same degree, in both groups, the increased circulation in the periodontal tissues, due to increased muscular activity in the mastication of the coarse food, resulted in more blood being carried through the tissues in a given time.

This phase of the experiment seemed to uphold the theory of an increased prevalence in periodontal disease as a result of modern methods of food refinement and preparation. As it is a difficult matter to change the food habits of a race, artificial methods of stimulation, such as toothbrush massage, will probably be substituted for tissue massage with coarse foods.

Another interesting result shown in these two groups of experimental animals was the difference in wear on the teeth. The molars of a guinea-pig meet end to end, with the lower molars inclining lingually and the uppers bucally. After a short time on the deficiency diets, the lower molars begin to tip farther lingually and the upper buccally, until finally the linguoclusal angles of the upper were in contact with the buccal surfaces of the lower. In the group whose diet contained the soft, flaky rolled oats, the original occlusal surfaces were still present when the animals were killed or died. But in the group on whole oats, new surfaces or facets were worn as the teeth moved.

An examination of the gross appearance of the skulls and mandibles of the three groups is enlightening. The bones of the group fed on the normal diet are dense and hard and strong. Those of the deficiency groups are honeycombed, frail and almost paper-thin. Definite areas of absorption are seen. The damage in the group on the harder foods is somewhat less than in the group on soft food. The destruction about the alveolar border is marked and resembles that seen in human skulls showing indications of extensive periodontoclasia.

Aside from the localized effects of these deficiency diets, we noted the pronounced lowering of the general resistance. A sudden drop in temperature when the window close to the cages was left open resulted in the death of the experimental animals, while the group on normal diet frisked about in the cold with no apparent ill effect.

Looking back at what happened to the bony structures of the cow on the milk test, and considering what occurred in the supporting tissues of the teeth of the guinea-pigs, it seems most reasonable to assume that we may make a definite application of these facts to our periodontal practice. If lack of minerals and vitamins can cause these changes in animals, why are they not an important factor in the closely related diseases of the human being?

The articles on diet that have appeared in the last few years in the popular magazines have done much to stimulate the interest of the public in a better dietary schedule, but general conditions are still far from good.

An infirmary experience with many cases of Vincent's infection has convinced me that diet must be an important factor in a large number of them. One case especially was selected for observation. A young woman with a moderately severe case of Vincent's of the chronic type was treated in the routine manner with very good results up to a certain point. But even with good massage and care, we could not get the case "over the peak." If dismissed for a few weeks, the patient would return with the symptoms fairly well pronounced again. On questioning the patient in regard to her diet,

we found that it was startlingly low in vitamins and minerals—probably another one of those cases of "maintaining the figure." One of the most pronounced symptoms was severe chronic constipation. We impressed on the patient that the tissues lining her oral cavity were a part of her alimentary canal and that it was difficult to conceive of this part of the tract's being in healthy condition with the greater portion of it unhealthy because of intestinal stagnation. Dietary measures were used to correct this condition with a very noticeable effect on the gingival tissue. Inquiry will reveal that many patients suffering from periodontal disease are also sufferers from chronic constipation. Dr. Howe has pointed out, in the experiments on guinea-pigs, that the diet of oats and milk quickly produces an intestinal disturbance with constipation. The absorption of toxins from a sluggish bowel may be a more important factor in oral conditions than we realize.

Let us consider some of the usual answers by patients to questions concerning their diets. We find that many of the older patients do not drink milk. If they do not use milk, either by drinking or in their cooked foods, where does their supply of calcium come from? McCollum says that every individual should get at least 1 quart of milk a day.

We find many patients substituting oleomargarin for butter and at the same time using little cream on their breakfast cereals. In these cases, should we not conclude that there is a limited intake of vitamin A?

A great many people are limited during the winter months in their consumption of fruits, with the result that their supply of vitamin C may be seriously lowered. When we consider the effect on capillary circulation when there is a vitamin C deficiency, it leads us to wonder whether this condition is not one of the most important ones to be considered. The majority of periodontoclasia cases start with marginal engorgement and sluggish blood flow, just the symptoms produced when scurvy occurs in experimental animals.

With the idea of using dietary measures as an aid in the treatment of these cases, how are we to advise our patients along these lines? The ideal arrangement, of course, would be to get the patient to eat the foods that contain he necessary elements. This should be done as far as possible, but it is a difficult matter, as stated before, to change the habits of a family. If certain foods do not please the palate or it is difficult to obtain them, they are not used. With this fact in mind, why would it not be practical to see that the patient receives daily a known, definite amount of vitamin-bearing material as a supplement to what we attempt to induce him to take in his regular food supply? Practically all authorities on diet recommend that every individual take cod-liver oil every day, especially during the winter months. Since it is necessary to resort to a specific vitamin-bearing food to supply A and D, why would it not be reasonable to insure at least a minimal intake of the other important vitamins in the same way?

Many people object to taking cod-liver oil, but it may be placed in 00 capsules, two of which hold almost a teaspoonful. In the same way, dried brewer's yeast can be given in capsules, and we thus insure the individual of a definite intake of vitamin B, which authorities regard as essential to the normal peristaltic movement of the intestine. By mixing 10 per cent oil of wheat germ with the cod-liver oil, we add vitamin E, which may or may not have important effects other

than that on fertility. It has been intimated by one investigator that E has a definite effect on iron utilization. If this is true, its use is important.

With the materials mentioned above, we have furnished our patients with vitamins A, B, D and E. If they do not relish, or cannot afford, the fresh citrus fruits, a liberal use of tomatoes in the diet will supply them with the much needed vitamin C. These materials are taken with the rest of their food at the morning meal and should be considered as food, not as medicine.

In addition, we should furnish our patients with proper charts so that the general dietary program may be as nearly correct as possible. This should be emphasized so that they will not depend entirely on the supplementary materials that are being given.

These suggestions are not offered as having been fully proved by tests, but observation in a few cases has given much encouragement to their further use. We must remove local irritations and other causative conditions, but by building up general resistance and improving the quality of the supporting tissues, we are just that much surer of a satisfactory result in our treatment.

The tremendous advance made in the last few years in the control of caries by dietary measures indicates clearly that dental health is closely linked with diet. If dietary conditions have such a definite effect on the hard structures of the teeth, they certainly can affect the supporting tissues more quickly. We feel that diet is not emphasized sufficiently to periodontoclasia patients and that the dentist has at hand this important aid in his therapeutic work.

E. V. McCollum, in closing his book, "The Newer Knowledge of Nutrition," says,

The concentrated efforts of the author during a period of fourteen years have been devoted to observing the effects of diets of different types on experimental animals. During this time a continuous search has been carried on for information of any and every kind which would aid in correlating the results of the laboratory with those of practical experience. Year by year this has increased his conviction that the scientific discoveries in the field of nutrition are destined to be recognized as the most fundamental of the agencies that contribute to the health, happiness and achievement of man. Some time must elapse before a full appreciation of the importance of approximating the optimum in the character of the food supply can be expected, but when appreciated at its full value, our knowledge in the field of the science of nutrition will be regarded as our most precious possession.

DISCUSSION

Isador Hirschfeld, New York City: I should like to ask Dr. Bryan if he noted to what degree or in what way the condition following the combination of movement and diet resembled suppurative periodontoclasia. Was there suppuration there? Was there an actual destruction of the alveolar process? Was there a recession of the alveolar process?

Dr. Bryan: This condition in guinea-pigs we are able to bring about in a very short time. In a period of five to six weeks, pigs usually die on the very restricted diet, and, as a result, some of the other complications, such as pus infection that we might see in longer continued cases, as in human beings, do not occur. In these cases, we did not notice any flow of pus. The teeth do get loose, and there is an actual destruction of the alveolar border, as shown in those skulls on the table. There is an actual destruction on the inferior surface of the mandible. The thing to be noted is how rapidly the texture of the tooth substance itself changes. The lower incisors increase their length very rapidly, not being used, because they do not have the material to chew on. They grow rapidly and then break easily. Sometimes, in the morning we go in and find a central incisor hanging by the gum tissue, and the margin broken. Once in a while we find there is actual destruction to the gum margin.

HISTOPATHOLOGY OF CARCINOMA OF THE MOUTH*

By RUDOLF KRONFELD, M.D., Chicago, Ill.

PATHOLOGIC conditions which may be the early stages of carcinoma are often first seen by the dentist and should be recognized and diagnosed by him before they become painful or alarming to the patient. A large percentage of all carcinomas occur in the upper parts of the alimentary tract, in the dentist's field of observation; and the dentist is thus in a position to render an inestimable service by recognizing these lesions in their very early stages. He should never disregard small incrusta-

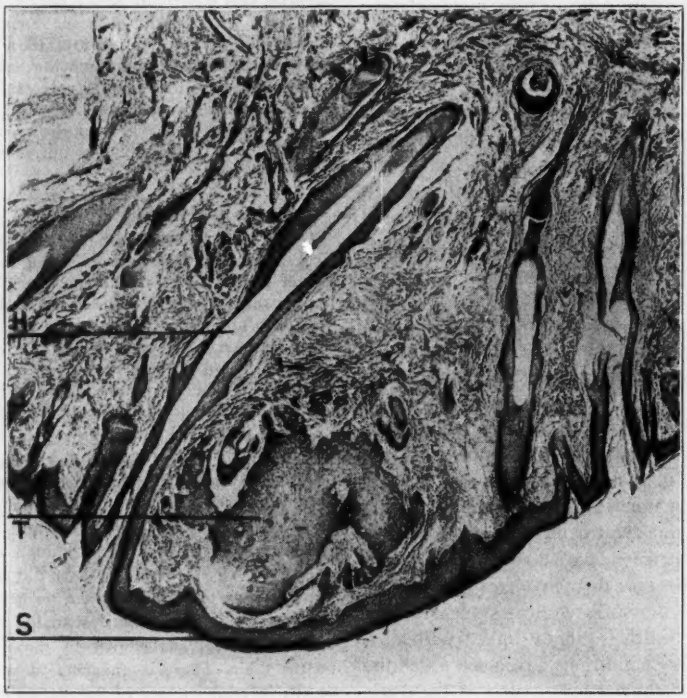


Fig. 1.—Carcinoma of upper lip. *S*, elevation of epidermis due to presence of epithelial tumor mass (*T*) in underlying tissue; *H*, hair follicles.

*From the Research Department of the Chicago College of Dental Surgery, Dental Department of Loyola University.

*Read before the Section on Oral Surgery and Radiodontia at the Midwinter Clinic of the Chicago Dental Society, Feb. 4, 1931.

tions or ulcers on the lips, tongue or oral mucosa that have a history of unusual persistence, but should urge the patient to have a diagnosis made at once.

The dentist, as a rule, is not in a position to give a histologic diagnosis of carcinoma; he should be familiar with the histopathology of the more frequent types of carcinoma of the mouth.

Fig. 2.—High magnification of tumor *T* in Figure 1. *E'*, peripheral epithelial cells, corresponding to germinative layer; *E"*, nuclei of squamous epithelial cells; *M*, mitosis; *H*, area of hornification.

In this paper, different specimens of carcinoma obtained by biopsy will be described, special emphasis being given to the histologic characteristics of the pathologic destructive growth of these tumors that lead to their microscopic diagnosis.

Carcinoma has its origin in the epithelial lining of the body surface or of body cavities, such as the oral cavity; or it develops from the epithelial tissue of glands (adenocarcinoma). According to the type of epithelial tissue from which the tumor originates, several types of carcinoma are differentiated. If stratified squamous epithelium is the source of the pathologic growth, the carcinoma consists of the cell elements that constitute this particular type of epithelium, and shows a decided tendency toward

hornification. If a carcinoma develops from the cylindric or ciliated epithelium of the nose, the maxillary sinus or the upper respiratory tract, it is usually built up of cylindric cells and shows no hornification. As the oral cavity is lined by stratified squamous epithelium, the hornifying carcinoma is the type that most frequently occurs in the mouth, other forms being less often found.

One of the most common locations for an oral carcinoma is the lips, especially the lower lip. Carcinoma of the lip occurs most commonly among men beyond the age of 40. At first, the tumor appears as a painless, inconspicuous little swelling of the lip; a little wound or crack forms, covered by a crust which, when removed, forms again, and the little ulcer shows no tendency to heal, but gradually becomes larger.

An early diagnosis of the condition is of greatest importance, as the prognosis in case of early radical treatment is a good one. The tumor can be removed and never recurs.

Figure 1 shows a section through a specimen at an early stage of carcinoma of the upper lip. Clinically, this tumor would appear as a small circumscribed swelling and induration on the outer side of the upper lip. In the section, we see the epidermis of the lip and numerous hair follicles (*H*). At *S*, the skin surface is slightly elevated because of the presence of a solid, bulky epithelial tumor (*T*) in the subcutaneous tissue. This epithelium seems to have no connection with the surface epithelium in this section. In other sections through the same specimen, one would find such a connection, since the carcinoma developed from the

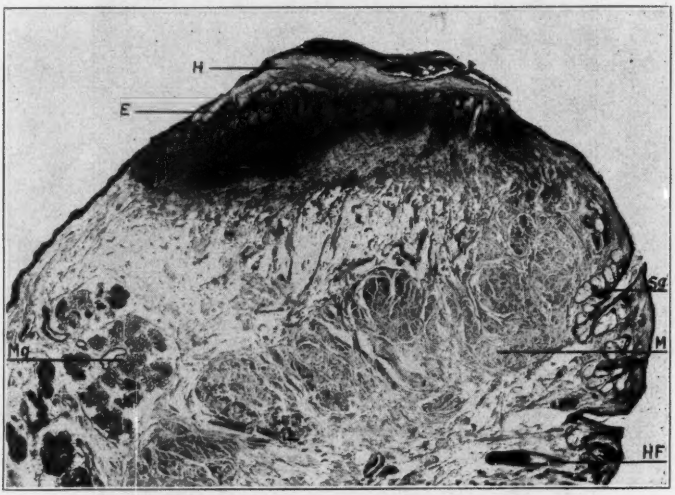


Fig. 3.—Labiolingual section through lower lip and carcinoma. *M*, orbicularis oris muscle; *SG*, sebaceous glands on outer side of the lip; *HF*, hair follicles; *MG*, mucous glands on inner side of lip; *H*, layer of horn on top of lip; *E*, epithelial strands proliferating in densely infiltrated tissue of lip.

surface epithelium. In a higher magnification, the epithelial masses arranged in the subcutaneous tissue resemble in their periphery the stratified squamous epithelium of the epidermis. Toward the center, the epithelial cells become larger and lighter, finally forming a structureless mass of horn. In Figure 2, these changes are shown under high magnification. At E^1 are the peripheral epithelial cells, corresponding to the germinative layer in the normal epidermis. At E^2 are the typical large nuclei of the squamous epithelial cells. At *M*, mitosis (cell division) has occurred in one of these cells. Other cells show degenerative changes, such as shrinkage of the nucleus and vacuolization. In some cells, the protoplasm is sprinkled with fine dark granules of keratohyalin; a preliminary step toward hornification. At *H*, the hornification is complete; the cell structure has disappeared, and the cells have been replaced by a homogeneous mass of horny tissue. As we shall see in the following specimen, this hornification is one of the

Fig. 4.—Higher magnification of area *E*, Figure 3. *H*, hornified layer; *HP*, horn pearls; *E*, epithelial strands; *I*, round-cell infiltration.

most important diagnostic landmarks in that type of carcinoma originating from stratified squamous epithelium.

The next series of illustrations concern different forms and stages of carcinoma of the lower lip. Figure 3 shows an early stage of epithelioma of the lower lip. The section runs labiolingually through the entire thickness of the lip. At *HF*, we see the hair follicles on the outside of the lip and large sebaceous glands (*SG*). At magnification (Fig. 4) of this area shows a part of the heavy layer of horn on top of the lip. From here, the epithelial proliferations enter the deeper tissues. At *HP*, two separate centers of hornification have formed. These so-called horn pearls are of lamellated structure, appear bright pink in a specimen stained with eosin and are very characteristic of this type of carcinoma. The deeper connective tissue is densely infiltrated. This round-cell infil-

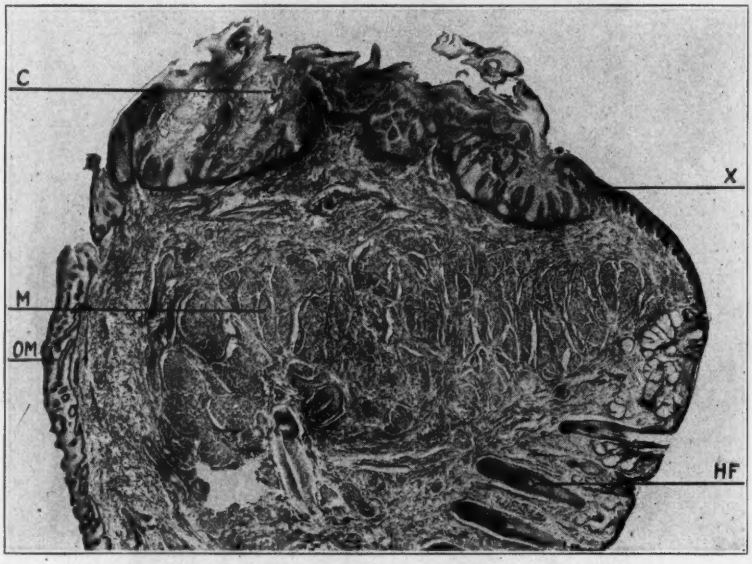


Fig. 5.—Labiolingual section through lower lip and carcinoma. *C*, carcinoma; *X*, borderline between tumor and normal epidermis; *HF*, hair follicles; *M*, orbicularis oris muscle; *OM*, oral mucosa showing thickening and proliferation (leukoplakia).

MG are the mucous glands on the inner side of the lip. The orbicularis oris muscle appears in cross-section (*M*). On top of the lip, there is a thick crust or bark of horny masses (*H*); beneath, the epithelium of the carcinoma (*E*) proliferates into the underlying, densely infiltrated connective tissue. A higher tration, which is always found in the tissues around a carcinoma, is due partly to infection, as germs pass through the breaks in the surface of the tumor and enter the deeper tissue, and partly to a reaction against tissue decomposition and destruction of proteins, which always accompanies malignant growth.

Fig. 7.—Labiolingual section through an advanced carcinoma of the lower lip. *HF*, hair follicles; *M*, orbicularis oris muscle; *G*, mucous glands.

Fig. 6.—High magnification of carcinoma shown in Figure 5. *H*, hornified layer on top of tumor; *EP*, epithelium proliferating into underlying infiltrated connective tissue *CT*.

Clinically, this form of carcinoma appears as an uneven, tough bark or crust adherent to the lip. When palpated with the fingers, the underlying tissue shows considerable induration, the result of the infiltration described above.

In Figure 5, a cross-section of a larger carcinoma of the lower lip is shown. Again, the section goes through the entire thickness of the lip. The normal labial epidermis ends at *X*. The tumor forms thus encircling small areas of subepithelial connective tissue. This condition is clinically known as leukoplakia or smoker's patch. Its etiology and relations to development of carcinoma will be discussed later on in this paper.

A higher magnification from the center of this tumor (Fig. 6) shows numerous plump epithelial projections (*EP*) that penetrate the inflamed subepithelial connective tissue (*CT*). On the surface,

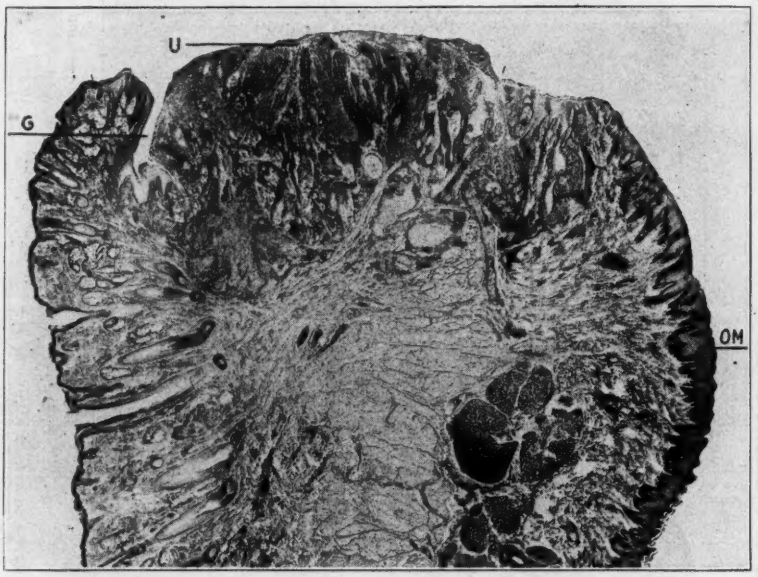


Fig. 8.—Labiolingual section through ulcerated carcinoma of lower lip. *U*, flat ulcer on top of lip; *G*, groove between carcinoma and normal epidermis; *OM*, oral mucosa, thickened and proliferated (leukoplakia).

a rather large, flat growth with uneven surface involving the entire upper convexity of the lip. The oral mucosa (*OM*) on the lingual side shows evident pathologic change in comparison with the corresponding normal area in Figure 3. The epithelium is very thick and has short projections, in the submucosa tissue, there are thick layers of hornified masses peeling off in part.

This type of carcinoma, when neglected, gradually spreads in all directions over the lip. Figure 7 shows such an advanced stage in which the entire lower lip was covered by a tough lobulated growth.

Not always is carcinoma of the lower lip characterized by such an increase of tissue. Sometimes, there is merely a raw area, an ulcer, present, representing a superficial loss of tissue rather than an overgrowth. Figure 8 was taken from a case of this type. The top of the lip is overspread with a flat ulcer (*U*), which is separated on the labial side by a groove (*G*) from the normal outer skin of the lip. From the ulcer, strands of epithelium proliferate into the tissue of the lip, which is densely infiltrated in this area. In these sections, the infiltration of the subepithelial tissue is so extensive that it is hard to find the epithelial tumor tissue among the countless inflammatory round cells. It is necessary to use high power (Fig. 9) to be able to distinguish between the much smaller round cells (polyblast) (*R*) and the large nuclei of the squamous epithelial cells (*E*). At *M*, a cell division (mitosis) is photographed in one of the epithelial cells.

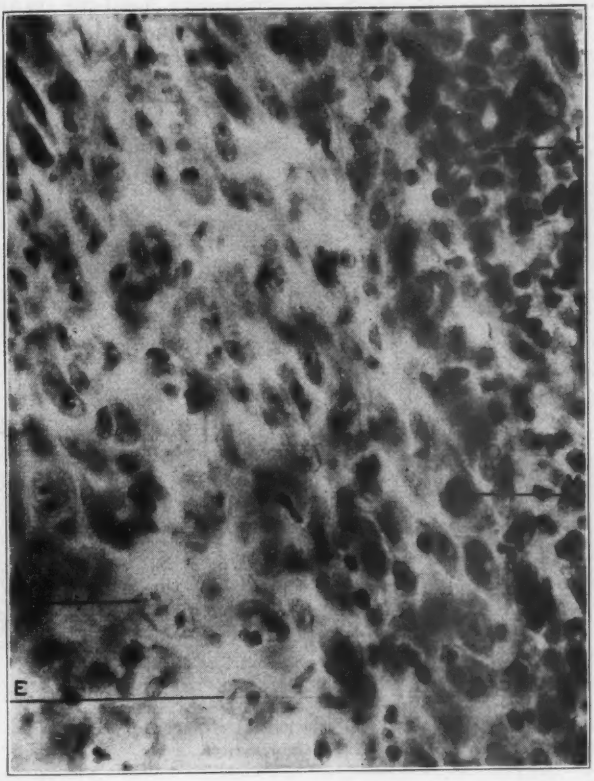


Fig. 9.—High magnification of tumor shown in Figure 8. *E*, nuclei of epithelial cells; *M*, mitosis in an epithelial cell; *I*, inflammatory round cells.

On the lips, especially on the upper lip, we sometimes find another type of carcinoma, the so-called basal-cell carcinoma, basalioma, or Krompecher's carcinoma, as it is called in German literature. It develops from the basal cells of the epidermis, and does not hornify, but forms large strands and masses of uniform small round epithelial cells (Figs. 10 and 11). The location of choice of this tumor is the epidermis of the face of older people, especially around and on the nose, forehead and cheeks. It grows slowly, is not very malignant and responds promptly to irradiation with radium or roentgen rays.

Next to the lips, the tongue is most often affected by carcinoma. Beginning with an area of induration, with or without the presence of a little ulcer, the carcinoma of the tongue soon develops into either a large, ulcerated defect or a proliferative, fungus-like growth. Histologically, we see in the large majority of cases stratified squamous-cell carcinoma. Other types of carcinoma (cylinder-cell carcinoma; basal-cell carcinoma) are more seldom found.

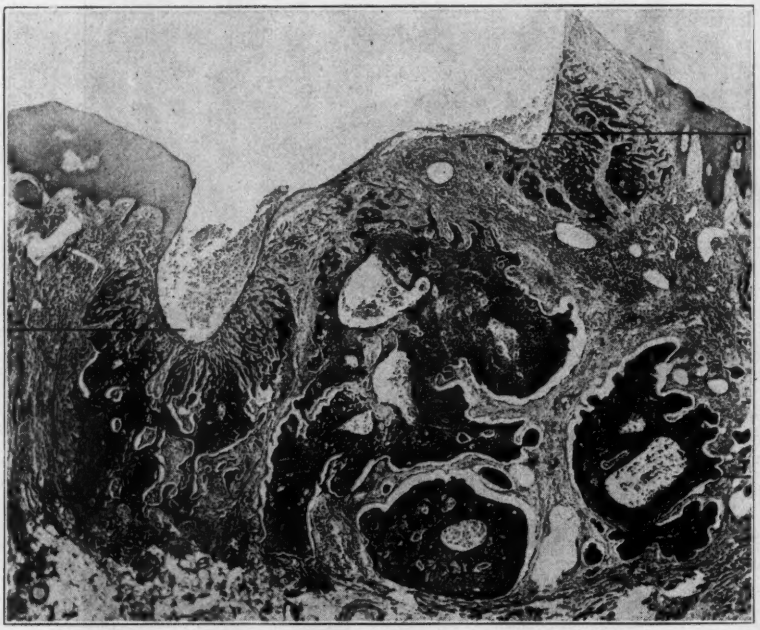


Fig. 10.—Basal-cell carcinoma (Krompecher tumor) of upper lip. *U*, ulceration from bottom of which tumor grows in deeper tissue; *T*, tumor masses.

Figure 12 shows a section from a carcinoma of the tongue. The surface epithelium (*SE*) is still intact in this area. Beneath, numerous strands and sprouts of carcinoma (*C*) grow between the muscle bundles (*M*) of the tongue. The individual projections show central hornification.

The propagation of carcinoma takes place by way of the lymphatics. The proliferating epithelial cells follow the lymph spaces in the tissue during their growth. If carcinoma cells become isolated and are carried away by the lymph stream, they reach the regional lymph glands and metastasis results. In case of carcinoma of the lip, lymph metastasis is first found in the submental lymph glands. In case of carcinoma of the tongue, the submaxillary lymph glands

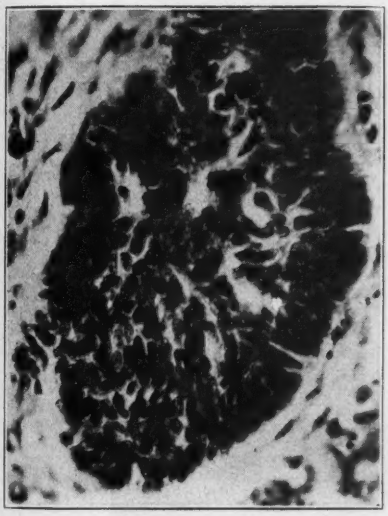


Fig. 11.—High magnification of tumor shown in Figure 10. Mass of small uniform epithelial cells from basal cell type.

are the ones affected. Figure 13 shows a section through a submaxillary lymph gland from the case shown in Figure 12. A large part of the lymph gland is replaced by the carcinoma through metastasis, formation of a central cystic cavity (*CY*) filled with desquamated cells and horn masses, a heavy layer of hornifying epithelium (*H*) and proliferating epithelial cells (*E*) in the periphery resulting. At *Ly*, there is still normal lymphatic tissue. Another smaller lymph gland (*LG*) of this region that was removed at the same operation shows a normal structure.

In the case of cancer of the tongue shown in Figure 14, a deeply ulcerated defect had been formed, with steep walls. From the bottom of this ulcer, as well as from its walls, the carcinoma proliferated extensively into the tissue of the tongue, which appears permeated throughout by the malignant growth. In this case, too, there was metastasis present in the lymph glands. The lymph glands were almost entirely changed into a cystic sac containing horny masses. Only remnants of lymphatic tissue were present.

Although it is not within the range of this presentation to discuss the various important points concerning the clinical differential diagnosis of carcinoma, a few illustrations will be given of conditions similar to cancer that are often seen. Figure 15 shows a section through a chronic ulcer of the tongue with heavy infiltration of the subepithelial connective tissue. The presence of numerous large giant cells (*GC*), the nuclei of which are clustered in a semicircle at the periphery of the protoplasm, substantiate, in this case, the diagnosis of tuberculosis of the tongue. Another growth that was removed from a lower lip by biopsy is seen in Figure 16. The clinical diagnosis of papilloma (benign) is verified by the well-maintained relations between epithelium and subepithelial tissue, as compared with the autonomous, uncontrolled, destructive growth of the epithelium *into* the subepithelial tissue in case of malignancy (carcinoma).

It has already been said that leukoplakia, a chronic inflammatory condition of the oral mucosa, often develops into

carcinoma. Leukoplakia certainly is the most frequently seen precancerous lesion in the mouth. Figure 17 shows a section from a case of leukoplakia of the palate. On the whole, there was no evidence of malignancy in this specimen. In a few places, the beginning formation of horn pearls could be observed in the center of some of the proliferated epithelial strands (Fig. 18). We must, therefore, consider this, from a diagnostic standpoint as a borderline case, in which a chronic inflammatory proliferation is becoming a malignant epithelial growth forming horn pearls of the type that are characteristic of carcinoma.

Leukoplakia, or smoker's patch, is a white area in the mucosa of the oral cavity. It varies in size and location. The cause of this condition is, in many cases, chronic irritation of long standing, such as smoking or tobacco chewing. In other cases, the origin is unknown. Histologically, the epithelium in the areas of leu-

Fig. 12.—Carcinoma of tongue. *SE*, epithelium covering surface of tongue; *C*, carcinoma growing in between muscle bundles *M* of tongue.

koplakia is proliferated and shows hornification on the surface. This hornified layer gives the oral mucosa an appearance similar to that of epidermis, having the characteristic whiteness. This color is the only difference between the area of leukoplakia and the surrounding tissue, its resistance and texture being identical to those of the normal mucosa. If malignancy sets in, it is likely to begin on the base of a leukoplakia. The tissue is piled up and becomes more resistant than the mucosa surrounding it, this difference in the texture and feel of the tissue being the important factor in making an early diagnosis of malignancy.

The last form of carcinoma to be discussed here is the carcinoma of the jaws. It does not vary much histologically from the forms described up to this point. They originate, for the most part, from stratified squamous epithelium. Figure 19

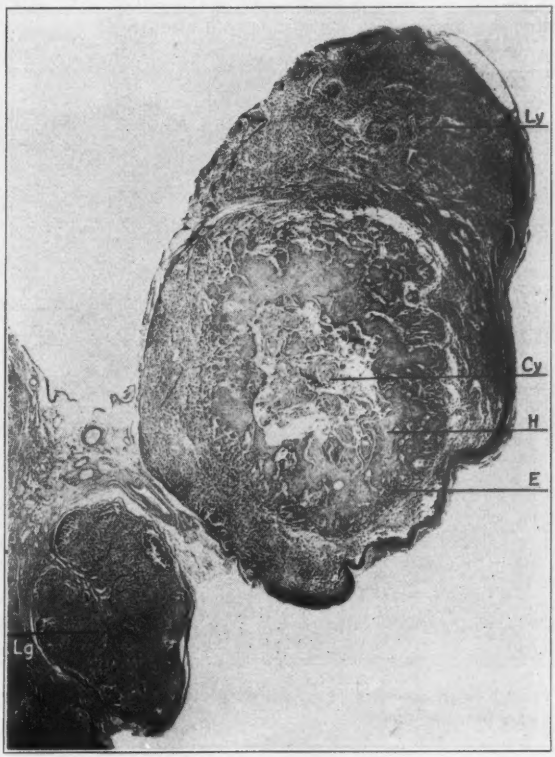


Fig. 13.—Submaxillary lymph glands from case shown in Figure 12; metastasis in lymph gland. *Cy,* cystic cavity in center of area of metastasis; *H,* hornified layer; *E,* epithelium (carcinoma); *Ly,* lymphatic tissue; *Lg,* smaller lymph gland without metastasis.

shows an area from a carcinoma of the upper jaw which appeared as an ulcer in the posterior part of the edentulous alveolar process. The concentric lamellated arrangement with hornification inside each individual sprout is very characteristic of this type of carcinoma. A high power photomicrograph from the periphery of the epithelium clearly shows the large polygonal squamous epithelial cells which

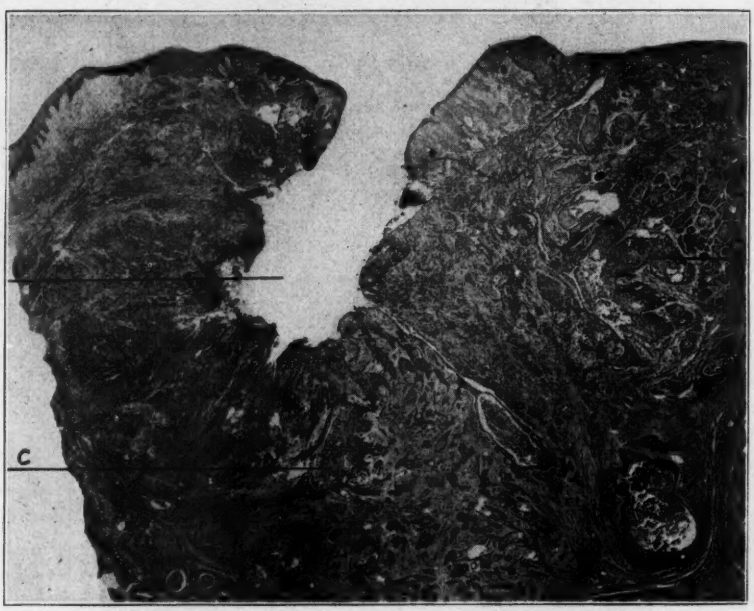


Fig. 14.—Advanced carcinoma of tongue. *U*, deep ulcerated defect from walls of which carcinoma *C* invades tissue of tongue.

are attached to each other by intercellular bridges (*IB*) (Fig. 20).

SUMMARY AND CONCLUSIONS

1. In a large majority of cases, cancer of the oral cavity (lip, tongue, jaws, cheeks) is a squamous-cell carcinoma.

2. Extensive hornification is one of the main characteristics of this type of carcinoma.

3. This hornification is also found in the regional lymph glands in case of metastasis.

4. The individual carcinoma cells show all the histologic varieties that are normally found in the epidermis between the germinative layer and the layer of hornification.

5. There is a deviation from the norm in that the cells show irregularities in size and shape and degenerative changes not found in the normal epithelial tissue.

6. The subepithelial connective tissue (stroma) of the carcinoma always shows considerable round-cell infiltration, which is due to secondary infection and to tissue decomposition.

Fig. 16.—Papilloma of lower lip. *E*, epithelium: *CT*, connective tissue (stroma).

Fig. 15.—Ulcer of tongue. The presence of numerous large giant cells (*GC*), the nuclei of which are arranged in the periphery of the cell bodies, leads to the diagnosis of tuberculosis of the tongue.

Fig. 17.—Leukoplakia of palate. *E*, epithelial proliferation.

Fig. 18.—Higher magnification of area of epithelial proliferations in Figure 17. *E*, epithelium; *HP*, horn pearl; *CT*, connective issue.

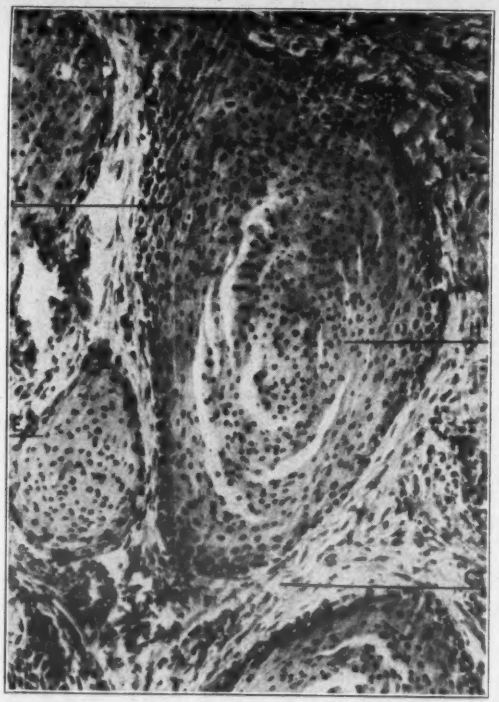


Fig. 19.—Epithelial masses (*E*) from a squamous-cell carcinoma of upper jaw (alveolar process). *H*, central degeneration and partial hornification of tumor; *CT*, connective tissue.

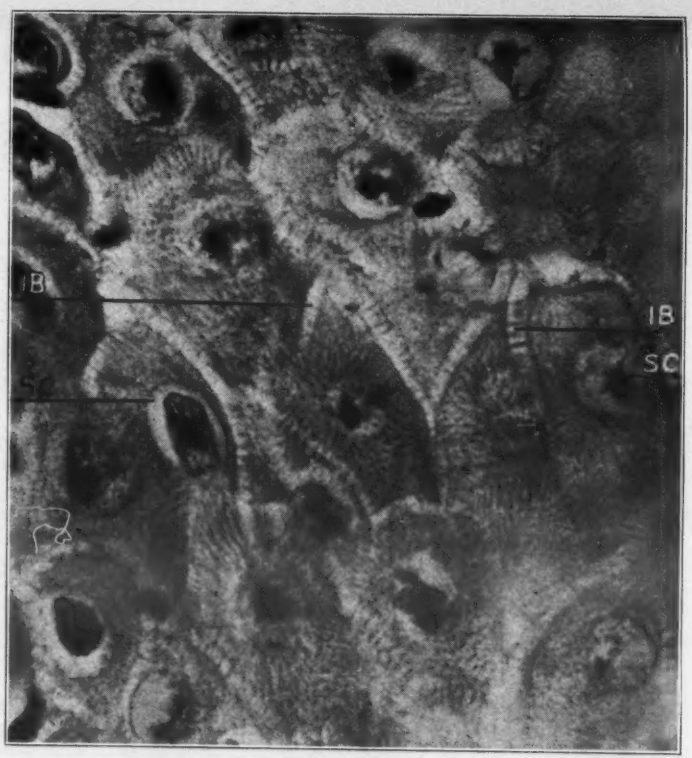


Fig. 20.—High magnification of *E*, Figure 19. *SC*, squamous epithelial cells; *IB*, intercellular bridges between the individual cells.

FUNDAMENTALS UNDERLYING THE PRACTICAL MANAGEMENT OF: VARIOUS ORAL SURGERY CONDITIONS; ROENTGENOGRAPHIC INTERPRETATION AND MOUTH DIAGNOSIS FROM A HEALTH STANDPOINT*

By EARLE H. THOMAS, M.D., D.D.S., LL.B., F.A.C.D., Chicago, Ill.

DR. A visits an oral surgeon at his office in order to see him perform an operation for the removal of an impacted third molar. Every phase of the technic is diligently observed and noted—where the incision is made, its length, how much of a flap is retracted, where the bone is removed, which instruments are used, etc. The operation is successful and the tooth is removed with apparent ease.

As a result of this visit, Dr. A sees no reason that he cannot remove third molars as expeditiously as can the oral surgeon, and so in the first case that presents, he uses precisely the same technic, but the result is atrocious. The same thing happens in the next case, and in other cases, before Dr. A decides to refrain from being a detriment to his patients, if some malpractice suit has not rudely awakened him before that time.

Now why did Dr. A experience such unfortunate results? For the simple reason that the oral surgeon had probably never before removed a tooth in exactly that manner and possibly never will follow the identical technic in any other case in the future. Yet Dr. A followed this same procedure in every case that presented. Why? Because he was without any knowledge of the fundamental principles underlying the removal of such teeth, and therefore could not realize the varying procedures which must be used in the application of these principles to each individual case.

Innumerable examples could be given to indicate how prevalent the idea is that a dentist can attend a clinic or two and then presume to practice oral surgery on his unsuspecting patients, but I think that fact is already appreciated. His failures are due mostly to what has been inferred in the preceding illustration—a lack of understanding of the fundamental principles underlying the diagnosis and the operative, postoperative and other care of the various disease conditions about the mouth.

However lacking a dentist may be in surgical judgment, technic or experience, he should at least have a knowledge of the fundamentals of the usual oral surgery conditions so that he can intelligently discuss with a patient the work to be done by the oral surgeon, render first aid (if I may use that expression), recognize when a disease condition has progressed beyond the stage where he should continue to care for it, appreciate the seriousness of the various conditions and their sequelae, know the conditions

*Read before the Section on Oral Surgery and Radiodontia at the Midwinter Clinic of the Chicago Dental Society, Feb. 3, 1931.

that are urgent and those that can be postponed for a reasonable length of time, and realize the relationship between oral infections and general constitutional disease conditions.

FUNDAMENTALS OF SOME COMMON ORAL SURGERY CONDITIONS

Cysts.—A cyst is an abnormal cavity in the bone or soft tissues lined with epithelium, a tissue which, of course, exudes fluid. This fluid, being in a closed cavity, accumulates, a continuous increase in the size of the cyst resulting which displaces the soft tissues and, when bone is involved, absorbs it through pressure necrosis. The roots of teeth, being much more dense than bone, resist such pressure necrosis to much greater degree, even to the extent of a cyst's causing destruction of the bone around a greater part of the circumference of the roots of teeth without detrimental effect on the surface of such roots. Even though such roots appear in a roentgenogram to protrude into the interior of a cyst, this may not be the case. In operating on a cyst, the fundamental principle is to remove every particle of cystic membrane. If one epithelial cell is left, it will proliferate and exude fluid, and the end result will be another cyst.

Of course, the operation is approached from such a point that (1) there will be the least possible destruction to the surrounding structures, and (2) after healing, a more efficient and esthetic restoration of the lost teeth and other tissues will be assured. This is a general fundamental principle applicable to all oral operations.

Most large cysts are approached through incisions at the buccogingival fold, not through tooth sockets or the alveolar ridge. Approach through the buccogingival fold avoids any interference with the normal contour of the alveolar process, and bridges or dentures may be worn during the after-treatment of the area of operation.

In most large cysts, the postoperative cavity becomes full of granulated tissue from the surrounding surfaces. Consequently, the larger the area of tissue surrounding a cavity of given size, the more rapid will be the healing process; and therefore, instead of being postoperatively packed wide open with gauze, the incised areas should be sutured together except for one small opening for drainage.

When a cyst has destroyed bone to the extent that it is in contact with the lining membrane of the maxillary sinus, the cyst wall should be carefully separated from the sinus membrane. This can usually be accomplished without puncturing the sinus, and thus the complication of infective sinusitis be avoided.

When a cyst has destroyed bone to the extent that the inferior dental nerve is partially surrounded by the cyst membrane, the latter should be carefully separated from the nerve without injury. If this is done, any resulting anesthesia of the lip will be transitory.

Teeth apparently protruding into the cystic cavity are not extracted until it is seen from the interior that they are hopelessly involved. If the pulps are vital and just the bone absorbed along one side of the roots, such teeth may often be retained in a healthy condition, and, in such cases, the bone regenerates to an apparently normal relationship with the roots of these teeth.

Fractures.—In a fracture, the fundamental principles are to approximate and immobilize bone fragments, preserve normal esthetic contours, obtain the best possible occlusion of the teeth and establish adequate drainage, if infection ensues.

Unless there is some bony contact at the line of fracture, bony union is very

doubtful, and a fibrous union may also be the result of insufficient immobilization. If the occlusion was very abnormal before the fracture, it may often be improved by changing the relationship of the fragments, provided this does not materially change the contour of the face. In fact, many times, jaws are fractured intentionally to accomplish this very purpose. When infection takes place, to obtain adequate drainage often necessitates a long incision followed by stripping the soft tissues from the bone along almost the whole line of fracture, and this area must be kept open by means of drains until all infection has subsided. In most instances, but not all by any means, this can be accomplished from within the mouth, and thus disfiguring scars be avoided. Teeth involved in the line of fracture are usually retained until after union and their status then determined. This is a matter of surgical judgment and depends on the condition present in each individual case.

When there has been considerable trauma of the soft tissues at the time of fracture, usually no immediate attempts should be made to secure perfect immobilization. It is sufficient to prevent excessive movement of the fragments until the acute swelling has subsided. When a mandible has been broken in several places, with considerable resultant swelling of the soft tissues, any immediate operation with the object of wiring the fragments together indicates poor surgical judgment.

Impacted Teeth.—The fundamental principle is to remove, with a minimum of trauma, sufficient of the overlying bone to allow the tooth to be released without exerting undue force. The amount and location of bone that should be removed depend on the individual case. The location and type of incision depend on the amount and location of bone to be removed, due consideration, of course, being given the blood supply. How this bone should be removed depends on the ability of the operator with the various methods. Each time the bone is touched by an instrument or gauze, and every moment the bone is exposed to the air or saliva, constitutes injury to that bone. Consequently, an expeditious method of operating is a blessing to the patient both from the standpoint of postoperative comfort and lessened time of after-care, not to mention the mental and physical strain of prolonged anesthesia.

Of course, the whole operation must be performed without injury to the adjoining teeth, and this suggests the point that second molars practically never have to be removed to make possible the removal of even the most difficult types of impacted third molars.

Removal of Teeth in General.—In the removal of a tooth, there are three fundamentals to be observed: (1) to get out all of the tooth; (2) to accomplish this with the least possible amount of injury to the surrounding structures, and (3) to so take care of the surrounding bone and soft tissues that the end result will constitute the best possible healthy foundation for the type of restoration to be subsequently inserted. To accomplish the latter, very often involves much more time and much greater skill than does the removal of the tooth itself. Furthermore, a healthy foundation can be obtained without curetting all granulomatous areas.

The public, by sad experience, is realizing, much more quickly than a certain proportion of dentists, that the extraction of a tooth is a surgical operation; and they are demanding the results obtainable only when correct surgical principles are followed. Following correct surgical principles does not mean that we must

make large buccal soft tissue flaps in every case.

It is very unwise to remove many infected teeth at one time. The use of such poor judgment may cause a serious enough reaction in a healthy patient; in a sick patient, it is more dangerous and might even be criminal.

Acutely Abscessed Teeth and More Extensive Acute Infections.—When acute infection develops at the apex of a tooth, the fundamental principle is to establish drainage with the least possible interference with normal tissue. In the first stage, this may be accomplished through the root canal of the tooth. If the infection spreads into the cancellous bone surrounding the apex, adequate drainage cannot always be obtained through the root canal, and the procedure is to remove the tooth.

If the infection has progressed to the stage of breaking through the cortical plate of the bone, with pus formation stripping the periosteum and causing considerable swelling of the surrounding soft tissues, the procedure is to leave the tooth in place, to incise through the tissues overlying the area of pus formation and to keep this incision open with drains until all pus formation has ceased and all acute inflammation has subsided, when the tooth may be removed. Were the tooth to be removed as a first procedure, adequate drainage would usually not be obtained, and the injury to the tissue opened up by the extraction might induce the development of an acute osteomyelitis, which might be fatal.

An infection of the type just described should not be referred to as an ulcerated tooth—it is far beyond that stage. It is now an acute infection of the cheek, lip, palate, floor of the mouth, throat or neck, and is a very serious condition which demands the doctor's profound respect. If the doctor has not had adequate experience in the handling of such infections, he should lose no time in referring the patient to one fully trained along such lines, because the patient's life may be at stake.

Incisions should usually not be made unless there is definite indication of underlying pus accumulation, regardless of the size of the swelling; also, one should keep in mind that the pus formation is not always under the point of greatest swelling.

Furthermore, most of these conditions can be brought back to normal by incisions from the inside, and thus disfiguring scars be avoided. For example, large accumulations of pus in the neck, extending down almost to the clavicle, may be drained through incisions in the floor of the mouth. In regard to drainage, gravity should seldom be considered, as infection practically always drains uphill as well as down.

One must not forget that there are times when outside incisions are absolutely necessary, and the experienced surgeon will immediately recognize when such action is imperative. At such times, radical treatment constitutes the most conservative treatment that could be given.

Many of the acute face, neck and throat infections that are referred to our office have been caused by block anesthesia injections made with infected needles.

Acute Osteomyelitis.—This constitutes an acute spreading infection in the interior cancellous structure of the bone, usually with marked constitutional symptoms, and the principle underlying the treatment is to establish adequate drainage in the least destructive manner. If this condition has started from a tooth, removing that tooth will seldom provide sufficient drainage, because the condition becomes very extensive before it can be

recognized. Removing several teeth might give sufficient drainage, but this is not necessary, because teeth that were not previously diseased can usually be preserved in a healthy condition even though at the time they are so loose that one would think they might fall out.

An incision to the bone along the labial or buccal aspect opposite the root ends of the teeth involved, even though it extends the entire length of the mandible, and the stripping of the periosteum from a considerable area of bone adjoining this incision, followed by the use of gauze packs to keep this bone exposed, will usually allow drainage through the cortical layer of bone to the extent that Nature will be given sufficient help to cope with the infection within.

If adequate relief is not obtained by this procedure, several openings may be made through the cortical layer to the cancellous structure within, but such a procedure is rarely necessary.

Necrosis.—In necrosis, an area of bone dies *en masse,* because of loss of blood supply from injury or infection. When this occurs from infection, it is usually due to a stripping of the periosteum from the bone by pus formation. Pus may strip the periosteum and lie in contact with bone for two or three days and the bone stay vital, but if such a condition lasts much longer without being relieved, the underlying bone is liable to die *en masse.* When such a condition occurs, Nature separates this dead bone from the living bone by osteoclastic activity, and this process roughly takes from two to four weeks in the maxilla, and from four to six weeks or longer in the dense cortical bone of the mandible.

The principle involved in the treatment is to avoid operative interference until the sequestrum is formed, and, in the meantime, to maintain continuous and adequate drainage to the involved area. When separated, the sequestrum can usually be readily removed without pain. A fine point along this line is that a week or so before a sequestrum is entirely separated, it may sometimes be forcibly fractured along the line of division, which saves some time in the healing process.

Even if a large section of the mandible becomes necrotic and is lost, bone can usually be regenerated if the periosteum has been preserved. Therefore, the periosteum in such cases should be maintained in the desired contour.

Local Anesthesia.—The fundamental requirement for obtaining results with block anesthesia is a thorough knowledge of anatomy, with special reference to bony landmarks, nerve trunk courses and areas supplied by the various nerves; and then a little practice at placing the needle point in the area desired.

The following principles must be observed in local anesthesia:

1. The needle must be absolutely sterile. One dare not risk a patient's life by inserting an infected needle one and one-half inches deep in the tissues.

2. The amount of epinephrin in the anesthetic solution should be the least compatible with obtaining anesthesia for a sufficient length of time to complete the operation. If this principle is followed, much after-pain will be avoided and also, in a large percentage, the development of so-called dry sockets.

3. No local injection should ever be made into an area acutely inflamed or acutely infected. Such a procedure spreads the infection past Nature's wall of defense, and often results in necrosis of a large area of the jaw or gangrene of the soft tissues, which may progress to a fatal termination.

4. No elderly patient with high blood pressure should ever receive a rapid in-

jection of a large quantity of local anesthetic with a high epinephrin content; that is, if there is any regard for the patient's life.

In making local anesthetic injections, a hypodermic needle is sometimes broken, the fragment remaining deep in the tissues. A general practitioner who suffers such misfortune should not attempt to retrieve the broken needle. Experience has shown that rarely is he successful, and usually the attempt results in serious and unwarranted injury to the patient.

Nitrous Oxid-Oxygen Anesthesia.—It is important that one be able to recognize bad gas risks before attempting to administer this type of anesthesia; also, one should refuse to give this anesthetic, regardless of the patient's demands, if the latter is considered a bad risk.

One should know his limitations in regard to the types of work that he can accomplish with careful and efficient operative technic under gas, and refuse to attempt operations under this anesthetic if they exceed his limitations.

One should always remember in connection with the two above-mentioned points that it is far better to be safe than sorry.

A mouth prop should be inserted between the teeth before the induction of gas anesthesia, even though the anesthetic is being administered for surgery not involving the mouth.

Vincent's Infection.—The diagnosis of Vincent's infection is usually made from subjective and objective symptoms. Microscopic examination may reveal the causative bacillus and spirillum without infection being present. Many cases have been seen in which ordinary pyorrhea was present, but the diagnosis was Vincent's infection because of the microscopic findings, and the ineffective and sometimes destructive treatment was based on this diagnosis.

One should have a great deal of respect for a true Vincent's infection. Profound toxic manifestations are seen in severe cases and death often ensues. To extract teeth in the presence of this infection is to take unnecessary chances with the patient's life. Neither should teeth be scaled until the acute symptoms have subsided.

Antiscorbutic diet is of great importance as an adjunct to medicinal treatment.

Sutures.—One often hears the following query, as well as others of similar nature: "Do you suture after removing impacted third molars?" After operative work, the tissues should be approximated to the position in which the operator wishes them to be after healing takes place. If, without suturing, the tissues will remain in this position, without danger of displacement, sutures are unnecessary, regardless of the length or position of the incision. If the tissues will not remain in the required relationship, suturing is, of course, necessary, no matter how short the incision. If one will apply his knowledge of anatomy and his power of observation, he will be able to make incisions with such relationship to normal muscular action that the need of placing sutures will be minimized, and when sutures are used, there will be less tendency for them to cut out.

So-Called Dry Sockets.—In a dry socket, the blood clot has broken down and the surface of the bone forming the socket has become carious. Such sockets should have all of the decomposed blood clot carefully removed, the surface of the bone dried thoroughly and the socket lightly packed with gauze saturated with an efficient obtundent. The principle is to obtund the nerve endings in the bone

and to protect the surface from saliva and air until Nature has covered this surface with healthy granulation tissue. One cannot expect to place a medicament carelessly in a socket that is a cesspool and get beneficial results. Causing further trauma by curettement of the dry socket appears to be illogical.

Where the soft tissues have been destroyed during a so-called operation to the extent that there has been left exposed bone that cannot be covered and protected by a suitable dressing, the surface of such bone should be cauterized to destroy all nerve endings. This will, of course, result in the formation of a thin surface sequestrum, which will subsequently be exfoliated, a healthy granulating surface remaining.

One should be able to control all pain in most dry sockets within five minutes.

Frenum.—When an orthodontist has advised the removal of a frenum to allow permanent approximation of the upper central incisors, the operation is only secondarily concerned with that part of the frenum which is visible. It is primarily concerned with the portion which extends under the gum tissue, between and lingually of the roots of these teeth, and which, through its elasticity, tends to assume its original shape after being compressed by the moving of these teeth into contact.

The gum tissue has nothing to do with forcing these teeth apart. Therefore the principle underlying the operation is to remove the frenum without destroying the overlying epithelium or gum tissue. The technic for such an operation has been described in another paper.[1] If this gum tissue is destroyed, the end-result from an esthetic point of view is almost as undesirable as the original condition.

Neuralgia.—Severe neuralgia of the branches of the fifth nerve may be caused by apparently trivial conditions which are often ignored by the dentist because he is searching for more pronounced conditions, such as impactions and extensive pathologic conditions. Some of the apparently trivial causes of neuralgia may be the presence of cavities, flat contact points, overhanging fillings and malocclusion of natural crowns of teeth, as well as fillings and bridgework, sclerotic bone impinging on nerve fibers and gum recession.

When the pain of a severe neuralgia localizes in a certain tooth, that tooth should not be removed unless it shows some definite pathologic condition other than pain, because, after removal of the normal tooth, the neuralgia will localize in another tooth, and so on, until all the teeth have been sacrificed, and the patient will still be having the neuralgia.

Paralysis of the Lower Lip or Tongue.—When this follows operative interference in the mandible, it does not necessarily mean that the inferior dental nerve or the lingual nerve has been severed or even injured. Inflammation following operative work is often the cause of a transient paralysis. Nerves are often injured by careless curetting of mandibular sockets, by the slipping of instruments or through a lack of good judgment in the making of incisions. One should remember that the lingual nerve sometimes lies very close to the surface in the third molar region.

When upward pressure is exerted by an elevator against the crown of an impacted lower third molar, any material amount of bone remaining over any portion of the distal surface of the tooth may act as a fulcrum and cause a downward pressure of the ends of the roots. If the mandibu-

1. Thomas, E. H.: Rational Minor Oral Surgery as Related to Orthodontia, J. A. D. A., 15: 1577 (Aug.) 1928.

lar nerve is in proximity to these roots, as is frequently the case, the nerve may be compressed, temporary paralysis resulting.

Maxillary Sinus.—During the removal of a tooth, if the floor of the sinus adheres to the root tip and thus an opening through the socket into the sinus is left, one should proceed as if there were no opening present. A normal blood clot should be allowed to form, and the patient should be instructed not to blow the nose for a few days, as this might dislodge the clot. The sinus should not be irrigated, nor should drains be placed in the socket.

When a fractured root is forced into the sinus, it should always be removed as soon as possible. This can usually be done through the socket by enlarging the opening into the sinus.

If an acute infection occurs in the sinus after removal of teeth, the sinus should be gently irrigated, with any bland solution. This may be done every second day until the infection disappears, which will usually be within two weeks. In the meantime, it is advisable to avoid packing the socket with gauze because we want no connection between the mouth and sinus during the interval of treatments.

Should an opening remain between sinus and mouth, an operation for the permanent closure of such an opening should be instituted as soon as possible. Sometimes this can be accomplished by removing sufficient of the alveolar process to allow the suturing together of the margins of the gum tissues. If the opening is too large for this procedure to be successful, flaps are made from the buccal or lingual soft tissues and used to close the opening. Such flaps should be about twice the size that the inexperienced operator would consider necessary.

Chronic maxillary sinus trouble, even though caused by teeth, should not be treated by the dentist unless he has had considerable training in this phase of surgery. There are many complications in connection with the nose that one must understand before he can render the service to which the patient is entitled, and this is usually beyond the field of the general dentist.

The mere fact that roentgenographic examination or transillumination shows one sinus more opaque than the other is not the final word in the diagnosis of maxillary sinus infection.

ROENTGENOGRAPHIC INTERPRETATION

Roentgenograms are shadow pictures of everything that is interposed between the x-ray machine and the film. To be able to interpret roentgenograms properly, one must be able to visualize the various structures from the appearance of their shadows, and also to visualize their relationship. A man skilled in interpretation can often visualize even the third dimension from the superimposed shadow relationship of the various structures, and his skill in so doing depends somewhat on his ability to recognize, from the shadows on the film, the angle of direction of the roentgen rays through the tissues. Bearing this in mind, one knows immediately that very seldom does the exact apex of the root of any upper tooth throw a readable shadow on a film. What one sees appearing as the apex is in reality the side of the end of the root.

The roentgen rays never lie; in cases in which they have been thus accused, we find the operator who interprets the film reading into it something that is not, or missing something that is. There are many normal dark areas in pictures, but these must not be confused with pathologic areas.

Also, one must be ever on the watch for latent imperfections in films, because such imperfections may simulate disease conditions.

All that some dentists look for in roentgenograms is badly abscessed teeth. That outlines the scope of their knowledge along the line of interpretation—they do not realize that there are innumerable things to look for besides abscessed teeth, and they cannot conceive of the fund of information that can be obtained by one who is thoroughly trained in interpretation.

You would be amazed to know the number of dentists who have not the slightest conception of roentgenographic interpretation, relying on some x-ray laboratory clerk's report as a basis for their operative procedures. Nonsensical, to say the least.

I asked the owner of one of the large laboratories why they did not discontinue sending out diagnoses with dental films, and his response was that it certainly was a joke, but that if they discontinued the practice, they would have to engage additional help to answer all the incoming telephone queries from dentists wanting to know what the various pictures showed.

MOUTH DIAGNOSIS FROM A HEALTH STANDPOINT

No mouth examination is complete unless it is made in conjunction with an adequate set of roentgenograms.

"Adequate" in this connection means that, to tell the complete story, all edentulous areas must be included, and that sometimes several pictures of one area must be made from various angles.

"In conjunction with" means that a real mouth examination cannot be made from roentgenograms alone. All surfaces of each tooth in the mouth should be examined with suitable instruments. All teeth should be tested for vitality. All areas of pericemental detachment should be explored to determine the extent of the detachment.

There is the dentist who realizes that no diseased conditions should be allowed to remain in the mouth, but who slides a mouth mirror over a few teeth, taps one here or there, asks if any of them hurt, and thinks that this constitutes a mouth examination, even if the patient is suffering from some serious general condition due to infection and has been sent to the dentist by a physician to determine the condition of the teeth and mouth. What wonder is it, then, that many physicians order roentgenograms of their patients' mouths, interpret them to the best of their ability and try to decide for themselves which teeth should be removed?

The experience of the oral surgeon would seem to indicate that a certain proportion of the dental profession is still working on teeth, not on patients; in other words, they are placing expensive restorative work on diseased teeth with apparently no thought of the possible, and eventually probable, detrimental effects on the health of the patient.

Because of this indifference or ignorance on the part of a percentage of the dental profession, more and more patients are going to the oral surgeon first, having all diseased conditions taken care of, and then reporting to their dentist for reconstructive work.

And perhaps this is the handwriting on the wall. Possibly if things do not change in the near future, we may have two classes of dentists: one to take care of the patient's mouth from a health standpoint, and the other to do the mechanical work. This is the situation in some other countries, and the dental

profession in America must live up to its responsibilities, or the same thing may occur here.

The foregoing paragraph was written before I read the article by the dean of the School of Dental and Oral Surgery of Columbia University, New York City.[2]

Many dentists have waxed eloquently sarcastic toward the dean of the dental department of Columbia University since he has said, among other things, that the dental needs of the public could be served by men technically trained in one year or less, working under adequate supervision. The dean added that they would be a more responsible group than most of those now operating, and he is not alone in his views. When one with an open mind views the bulk of dental work in the mouths of the masses, and asks himself if this is as good as that which a senior in dental college is required to do before his work will be passed by the supervisor, I wonder how he should answer his own question.

The dean of this dental department has been referred to as a "self-ordained prophet of this professional revolution." The members of the dental profession should know that it is no new thing that he has said: these things have been under discussion by enlightened men of the dental profession for many years.

Several years ago, Surgeon General Cumming of the U. S. Public Health Service said: "Dentistry must recognize to a greater degree and equally assume its public health responsibilities, and unless it does so, an oral specialty in medicine will inevitably be organized."

Possibly you may be interested to know that patients who are referred to an oral surgeon for a definite operation often try to get his opinion as to the condition of the rest of the mouth, because there is a suspicion in their minds that possibly they have not received the best advice from the standpoint of their health.

The procedure in most offices is to avoid giving any opinions unless requested by the dentist, but very few dentists are anxious to have us give the patient our opinion. Why? The answer to this query will suggest the reason for the oral surgeon's procedure, as just mentioned.

If patients come in directly, or are referred by physicians, they are, of course, given a thorough mouth examination and consultation, that is, if they are willing to pay for it.

Many times, we are requested by physicians to make mouth examinations for patients who see no reason for coming to us for a consultation as they "have one of the best dentists in Chicago" and he "just finished" with their mouths last week, or last month, and their mouths are in perfect condition." Many of these patients have been suffering from some systemic infection, and how often in such cases have we found it necessary to write the physician a full page letter to inform him of all the disease conditions present. Although our examination is from the health standpoint only, in these cases we also call attention to a few of the cavities still present, the flat contacts, leaky fillings, malocclusion, deposits, overhanging fillings, etc.

You may ask what recommendations are made from a health standpoint, after a consultation. Of course, each tooth is considered individually and in relation to the general condition of the patient, and, in conditions caused by focal infection, we may be very radical, if you wish to call it that. But even if the patient is

2. Bulletin of Information, Columbia University, New York, October, 1930.

in fair health, in general the advice given is as follows:

Of course all cysts, acute infections, necrosis and other major conditions should be given proper attention.

Extraction of all pulpless teeth that show the slightest break in the pericemental membrane is advised.

Extraction of all teeth affected by pyorrhea to the extent that they cannot be made healthy by treatment or surgery is advised.

Removal of all impacted teeth is advised, unless it is desirable to move them into healthy functional occlusion, and, in this connection, most impacted cuspids in young people can be brought to place by orthodontic procedures. Several reasons for removing all impacted teeth have been given in another paper.[3]

Many fully erupted third molars show bone absorption in proximity to their distal surfaces, due to retained infection under deep gum flaps. Extraction of such teeth is advised because they can cause more general trouble than an abscessed tooth, as a result of apparent greater absorption into the general system from the region of the throat.

Removal of all abscessed deciduous teeth is advised. No one knows what proportion of heart disease in children is caused by such teeth, and that disease in children has assumed alarming proportions. Under such conditions, we should not dare to temporize.

Pulpless teeth that show no definite signs of trouble are mentioned in the report, with an added phrase that "no such teeth are above suspicion from a focal infection standpoint." Furthermore, their possibilities for harm are always explained to the patient.

3. Thomas, E. H.: Oral Surgery Conditions of Interest to the General Practitioner, J.A.D.A., 16: 1997-2004 (Nov.) 1929.

The Pulpless Tooth Problem.—I am referring here to teeth which show no break in the pericemental line around the apex, and which feel no different from vital teeth on percussion. Sometimes, a tooth can be abscessed and have a pus-discharging sinus opposite its root-end, and yet in the roentgenogram show no break in the pericemental line; nor would there be any tenderness on percussion. Such teeth will be excluded from consideration under the pulpless tooth problem.

Now, supposing there is no evidence of any kind whatever of apical irritation of a pulpless tooth. To the best of my knowledge, there is no dentist in this country, or any other, who knows any method whatever of definitely determining that such a tooth is not menacing the patient's health.

As to the other side of this question, neither is there any dentist who can prove that any one particular pulpless tooth is causing harm. However, it is a very common occurrence to have some severe and dangerous iritis or other condition due to focal infection cleared up by removing just one such tooth.

What are we to do under these conditions? If we do not advise the patient to have these teeth out until after detrimental effects are apparent, it is like locking the barn door after the horse is gone.

In the present state of our knowledge of this problem, I think the most logical thing is to advise removal of most pulpless teeth that are adjacent to a space where other teeth have been removed and restoration is necessary. One more tooth on a partial denture or bridge will not be noticed by the patient, and a potential source of trouble will have been removed.

There is an economic phase to be considered here also. If a bridge extends from one vital tooth to another, there is

no reason that it should not give the patient several years' good service. If the bridge extends from a vital tooth to a pulpless tooth with the adjoining tooth vital, and this pulpless tooth becomes acutely abscessed one month after the bridge is set, or six months or one year after, the tooth must be removed, and the patient will be compelled to pay for extending the bridge to the adjoining vital tooth. Under such conditions, it is only logical that the patient should prefer to pay a different dentist for the new bridge.

If pulpless teeth remain with the adjoining teeth vital, I think the only fair procedure is to educate patients and let them decide. Tell them all about pulpless teeth, and let them know that no mouth can be given a positive "O.K." from a health standpoint if there is one pulpless tooth present. Then, if they wish to assume the responsibility of retaining such teeth—well and good; if not, the teeth are removed. Some patients are willing to take the chance; others are not. Is it not the fair thing to let the latter patients know the possibilities and thus give them the opportunity of having a positively healthy mouth?

This procedure may seem like straddling the fence, but until it can be proved that pulpless teeth can be so treated as to be positively prevented from causing systemic infection, it is far better to allow patients to decide the question as to extraction and not to force them to retain in the mouth pulpless teeth that they would want out if they knew the possibilities.

In a nutshell: No pulpless tooth is above suspicion from the standpoint of focal infection and the fewer there are in a mouth, the better.

Focal infection is not a fad, and it has not passed the way of the fads. It is still the most important problem before the dental profession, and when all is said and done, health and life are worth more than all the teeth in the mouth.

30 North Michigan Avenue.

DIAGRAMMATIC RECORDING OF PERIODONTAL DISEASE*

By ISADOR HIRSCHFELD, D.D.S., New York City

ALTHOUGH the science of periodontology is developing steadily, we all realize that it has not yet passed the pioneer stage. Granted that we are very often able to achieve excellent results in the treatment of periodontal disease, the underlying etiologic factors of various types of periodontoclasia remain unsolved. The praiseworthy efforts of individual investigators in laboratories will no doubt eventually help to solve many of our problems, but the work of the clinician is, to say the least, of equal importance. By making reliable graphic records of clinical pictures and consistently using them for comparison as the cases progress, he attains a

*A contribution to the annual report of the Committee on Scientific Investigation.

*Read before the American Academy of Periodontology, Colorado Springs, Colo., July 17, 1930.

broader clinical appreciation of diagnosis and prognosis in periodontal disease and a more comprehensive evaluation of the efficacy of the various methods or steps in treatment.

It is self-evident that the clinician's observations, to be fruitful, should be recorded accurately and in detail, since data dependent on memory have comparatively little scientific value. As a matter of fact, such records have proved invaluable to myself and to my patients so frequently and in so many ways that I cannot but feel that the making of reliable records should constitute an integral and indispensable part of routine in one's practice, general or special.

Among the various means which may be employed for the recording of gross clinical abnormal and pathologic conditions of the teeth and periodontium, the outstanding ones are roentgenograms, photographs, casts and record charts. Of course, especially for the student of periodontology, the ideal method should include them all, as each has its special advantages. This is not always practical, and, of the four, the record chart I find is the most indispensable.

DIAGRAMMATIC CHARTING

As the various methods of charting in general use are inadequate for practical purposes, I have formulated, by a process of elimination, a series of about fifty diagrammatic symbols (Fig. 1) which may be noted down rapidly and accurately, and, like a photograph, read at a glance. These were planned with the idea of achieving both simplicity of execution and close resemblance to the respective symptoms, so that their code might be memorized with little effort. They may be recorded, preferably with a lead pen-

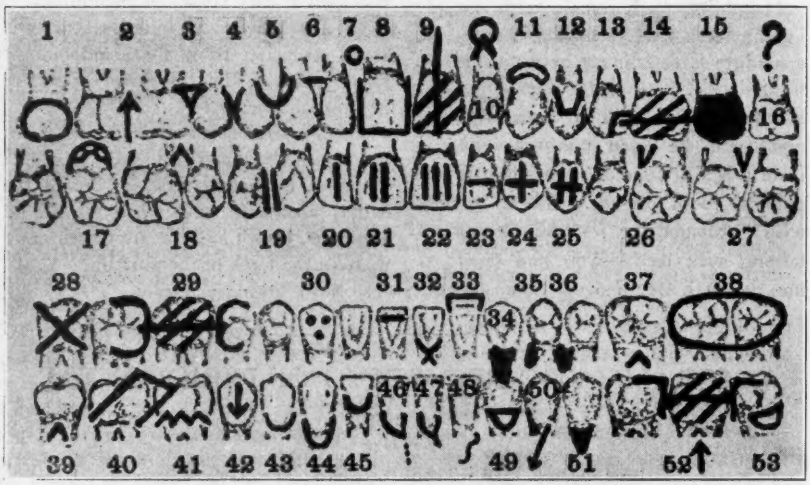


Fig. 1.—Chart of diagrammatic symbols. The numbers opposite the respective characters represent the numbers in the explanatory code contained in the text as well as those in the key to the code.

cil, either on one of the ordinary colored dental examination charts procurable at the dental supply houses and which may be appended to the usual case history, or, as in the case of institutional work, on similar charts printed on either side of such case history blanks.

down and read with greater facility. 2. More detailed recording of size, form and location of clinical entities is allowed, and thus the chart becomes an itemized record of the examination. 3. Because of the facility and simplicity of such charting, the operator is prompted to make a

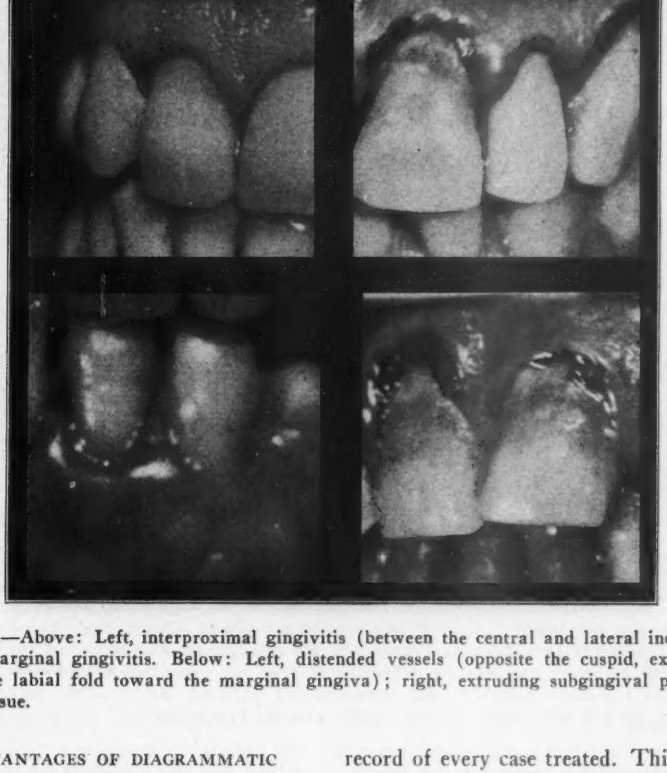


Fig. 2.—Above: Left, interproximal gingivitis (between the central and lateral incisors); right, marginal gingivitis. Below: Left, distended vessels (opposite the cuspid, extending from the labial fold toward the marginal gingiva); right, extruding subgingival proliferating tissue.

ADVANTAGES OF DIAGRAMMATIC CHARTING

The chief advantages of diagrammatic charting over the methods heretofore employed are: 1. The symbols can be noted

record of every case treated. This tends not only to render his periodontia service more scientific and thorough, but also to enrich his material for research, should he have occasion to use it.

CLINICAL OBSERVATIONS AIDED BY DIAGRAMMATIC CHARTING

This method of charting has proved invaluable to me in corroborating the following interesting clinical observations, among others:

1. *Cervical Hypersensitiveness.* — By a detailed checking up of points indicated on the chart as sensitive (Fig. 6), with the corresponding areas in the mouth, after a brief period of corrected toothbrushing, it was possible to determine a definite relationship, on the one hand, between improper brushing and the development of the sensitive areas, and, on the other, between properly directed brushing and complete elimination of these areas. After verifying this to my satisfaction, I was able to establish a differential diagnosis of the etiology of certain types of hypersensitiveness which could be invariably treated successfully by corrective toothbrushing alone and without the aid of desensitizing drugs.

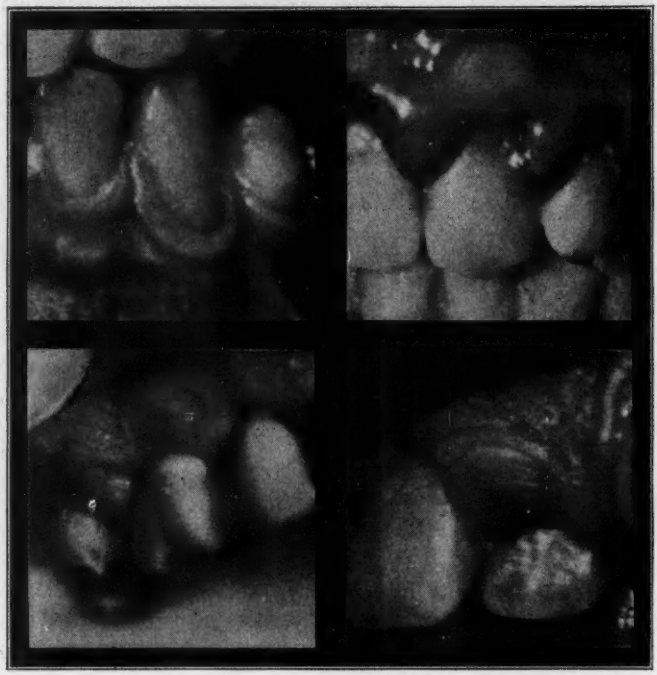


Fig. 3.—Above: Left, gingival festoon (the one here presented is of physiologic reaction, being pink and hard and must be differentiated from the puffed up, deeper colored, shiny festoon of pathologic origin); right, hypertrophied papillae. Below: Left, pseudopapilla (between the first and second molars); right, gingival hypertrophy.

2. *Pyorrheal Pocket Development.*— A comparison of the size and location of pyorrheal pockets marked on the original examination chart, with those sometimes

found in the mouth a number of years after completion of treatment (Fig. 7), has, in a number of instances, disclosed the interesting fact that while there were new deep pockets about teeth where formerly none were recorded, those which had been originally indicated were apparently entirely eliminated. The latter finding proved conclusively that the beneficial effects of thorough, specifically directed "conservative" periodontal treatment are permanent. On the other hand, the question as to why new pockets were found opened the way to a number of theories. That the new pockets were not inaugurated by occlusal strain acquired through the reduction of traumatic occlusion on the teeth formerly treated is evidenced by the periodontia service records of some of these cases, indicating that no grinding had been done. The two most plausible theories are (1) that at the time of the previous examination, instead of carefully entering with an explorer, every gingival sulcus, I tested and recorded only those where the outer appearance of the gingivae aroused suspicion or where macroscopic pus could be expressed; (2) that an incipient pathologic process may have been present in

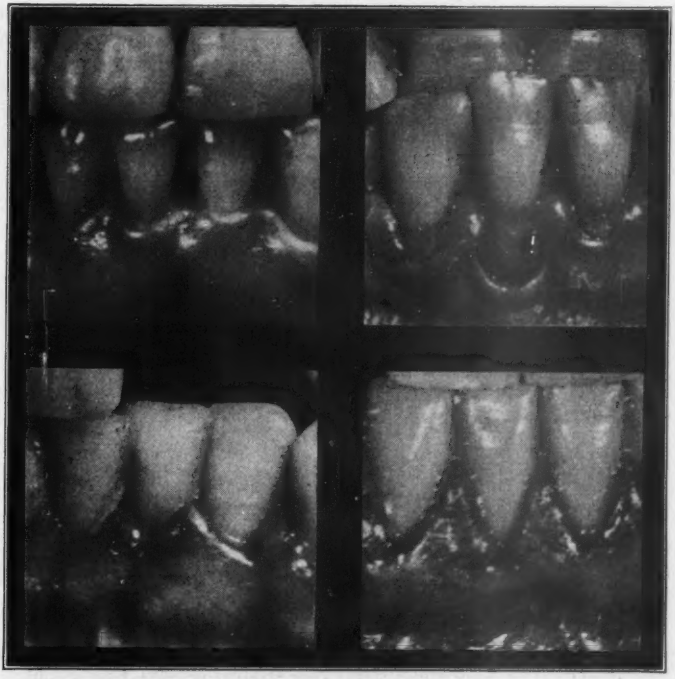


Fig. 4.—Above: Left, papillae missing; right, symmetric recession. Below: left, asymmetric recession and linear depression opposite left lateral incisor, gingival cleft opposite left central incisor; right, multiple cleft.

the periodontium though not yet clinically evident. Assuming that either surmise may be correct, I am now more scrutinizing in my examinations and treat each apparently healthy tooth more or less as a potential pocket-forming agent.

Other clinical observations definitely checked up through the diagrammatic record chart are: the remarkable degree to which a loose tooth may tighten up soon after the elimination of a severe form of traumatic occlusion; the degree of regeneration of septal gingiva that is possible after successful treatment of Vincent's infection (Fig. 8), as well as after the elimination of food impaction, and the more or less rapid and complete disappearance of pseudopapillae and other pathologic periodontal entities as a result of successful treatment.

Fig. 5.—Left, destruction of septal gingiva by Vincent's infection (causing punched out appearance); right, gingival fistula over the central incisor, leading to a spiral pocket situated on the mesiopalatal side of the tooth.

USE OF CHART IN TEACHING

At the School of Dentistry, Columbia University, where a diagrammatic code chart (Figs. 9-10) is in routine use by the students in the periodontia courses, we have found that this means of recording plays a definite rôle in training them to observe more keenly, not only the advanced, but also the incipient symptoms. Its value in this direction is frequently demonstrated when, early in the course, the instructor checks up the patients' mouths with the examination charts made by the students. He finds that numerous gingival symptoms are overlooked. Indeed, the student often complains that his patient presents no symptoms for recording. Needless to say, as the instructor commences to record and point out the various deviations from normal in the color and contour of the gingivae, the student gets his first feeling of seeing these with a "high power focus."

When a student who is about half through with the treatment of his patient recognizes a definite improvement by a comparison with the record chart, he is prompted to follow the case through to completion with great enthusiasm.

When patients treated in previous classes return periodically for checking

up, the new students who have never seen them before treatment have the benefit of the record chart for their appraisal of the actual degree of improvement. This gives the student opportunity to observe, at first hand, prognosis of various conditions after a lapse of time.

ing at his first visit and appreciates fully the possibilities of the record for future comparison. He understands that in it he has a definite check on the condition of his mouth, and when the final check-up actually shows that the various pathologic symptoms recorded have been elimi-

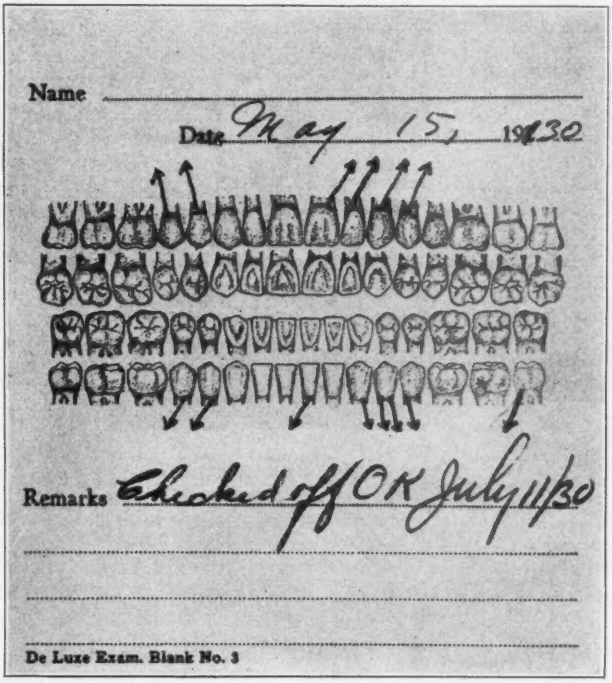


Fig. 6.—Diagrammatic chart of a case in practice in which the main complaint was cervical hypersensitiveness. As indicated, within two months all sensitiveness disappeared, the diet and toothbrushing method having been corrected.

OTHER USES

The diagrammatic record chart has practical value as well as scientific. A few instances will serve to illustrate. Frequently, an intelligent patient notices the painstaking and accurate chart-

nated, his confidence in the effectiveness of the periodontia services rendered is complete, and his continued enthusiastic cooperation is assured.

Recently, a woman who holds a responsible position, after watching me

record the various symptoms exclaimed, unsolicited, that, for the last ten or more years, she had hoped that her dentist would make just such a detailed record that might be used to assure her that the condition of her mouth was, at least not retrogressing. When, for some reason or other, a patient, asserting his disappointment in the results of treatment, has attempted to put the dentist on the defensive, a diagrammatic chart has several times proved an effective aid in saving the operator from unjustifiable humiliation and financial loss. Just recently, a patient whose savable teeth had been successfully and completely treated for suppurative periodontoclasia, refused to pay the balance of the fee then due according to the agreement, claiming that since certain of her teeth had to be "extracted finally," the services were partly disappointing and that, therefore, I was not entitled to the entire fee. When she was confronted with the original diagrammatic chart

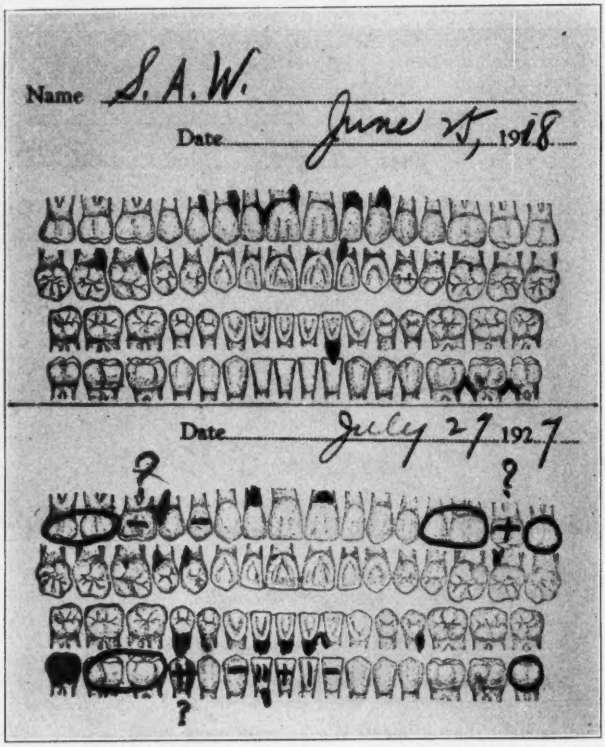


Fig. 7.—Two charts of one patient, made seven years apart. During this period the patient failed to return for occasional checking up and oral hygiene was neglected. While formerly healthy areas now show advanced periodontal disease, the parts treated remain healthy.

which indicated definitely that the teeth in question were marked as of either negative or doubtful prognosis, she realized the unfairness of her contention and paid promptly.

CODE

Although the diagrammatic symbols herein presented have so far proved quite satisfactory to me, they might, of course, be changed advantageously according to individual preferences, or new ones added. It is essential that the characters finally selected be used consistently, if their maximum value is to be attained. This must, as a matter of standardization, be especially stressed in institutional work, as in clinics, hospitals and dental schools, where a patient is frequently treated at various times by different operators.

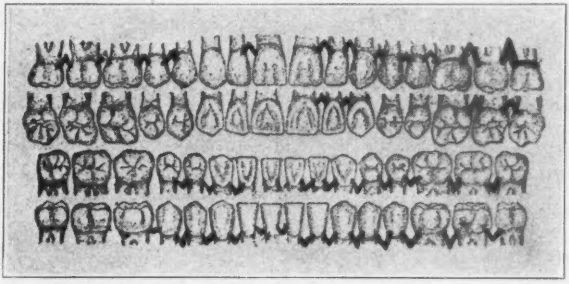


Fig. 8.—Diagrammatic chart of a case of Vincent's infection. The different sizes of the symbols here shown denote the relative degrees of interproximal destruction. Such charts are employed for purposes of comparison with the condition of the mouth after healing or with the distribution of areas attacked in a reinfection.

EXPLANATION OF CODE SYMBOLS

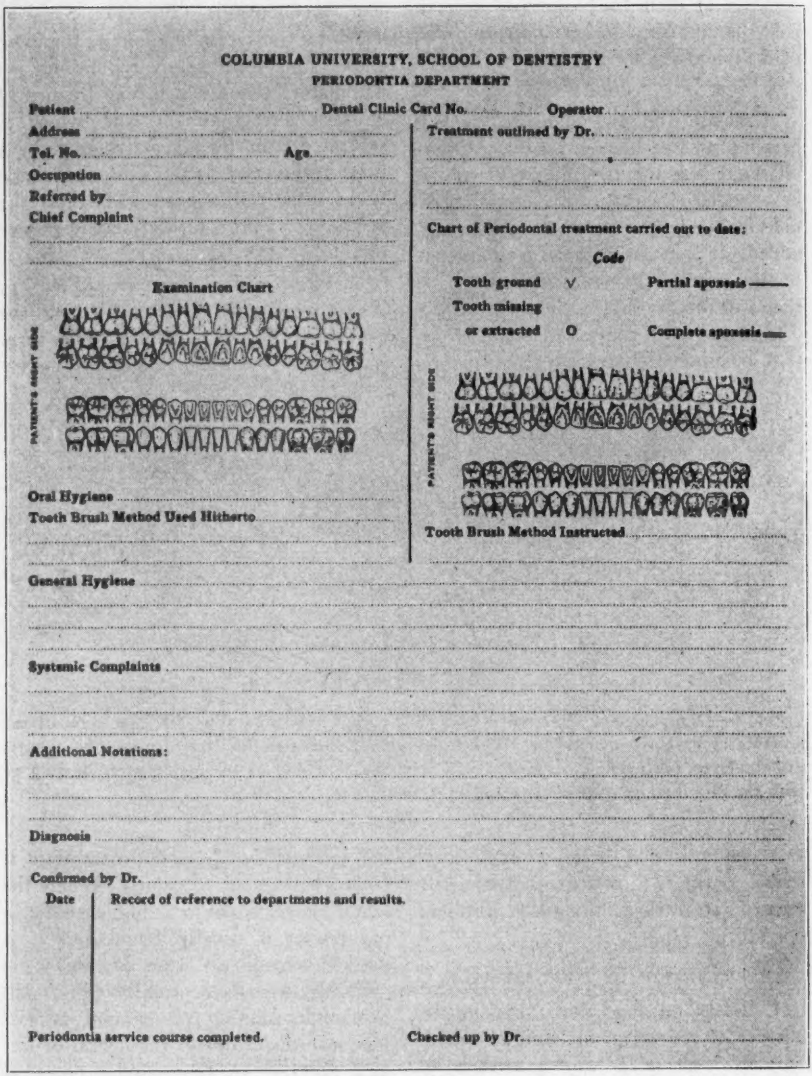
1. Tooth missing: Zero, showing the absence of a tooth at the time of examination. A group of missing teeth is indicated by an ellipse enveloping that area. (See 38.)

2. Food impaction: Arrow, pointing apically, placed either between the crowns or roots of adjoining teeth.

3. Pseudopapilla (Fig. 3): Same as 4, with a transverse line joining the loose ends. This term refers to chronic inflammatory tissue which may frequently be seen interproximally and which is separated from the alveolar gingiva by a deep transverse cleft. This pathologic tissue usually disappears soon after the beginning of instrumentation and proper toothbrushing.

4. Interproximal gingivitis (Fig. 2): Two joined curved lines forming the normal outline of a papilla. This term is applied where the papilla is merely red but not swollen, to differentiate it from a hypertrophied papilla. Where the septal tissue is not red, but cyanotic, a pus pocket is usually found and it is marked accordingly. (See 35, 36.)

5. Hypertrophied papilla (Fig. 3): Semicircle, running from a point more or less near the center of the buccal or lingual gingival arc to a similar point on the adjacent tooth. The size of this symbol corresponds to that of the actual lesion.



COLUMBIA UNIVERSITY, SCHOOL OF DENTISTRY
PERIODONTIA DEPARTMENT

Patient ..... Dental Clinic Card No. ..... Operator .....
Address .....
Tel. No. ..... Age .....
Occupation .....
Referred by .....
Chief Complaint .....

Examination Chart

PATIENT'S RIGHT SIDE

Oral Hygiene .....
Tooth Brush Method Used Hitherto .....

Treatment outlined by Dr. .....

Chart of Periodontal treatment carried out to date:

Code

Tooth ground V Partial apoxesis ——
Tooth missing or extracted O Complete apoxesis ——

PATIENT'S RIGHT SIDE

Tooth Brush Method Instructed .....

General Hygiene .....

Systemic Complaints .....

Additional Notations:

Diagnosis .....

Confirmed by Dr. .....

Date	Record of reference to departments and results.

Periodontia service course completed. Checked up by Dr. .....

Fig. 9.—Photograph of the chart employed in the periodontia clinic and classes at the School of Dentistry, Columbia University. In the original, the dental charts are printed red to bring out the superimposed symbols.

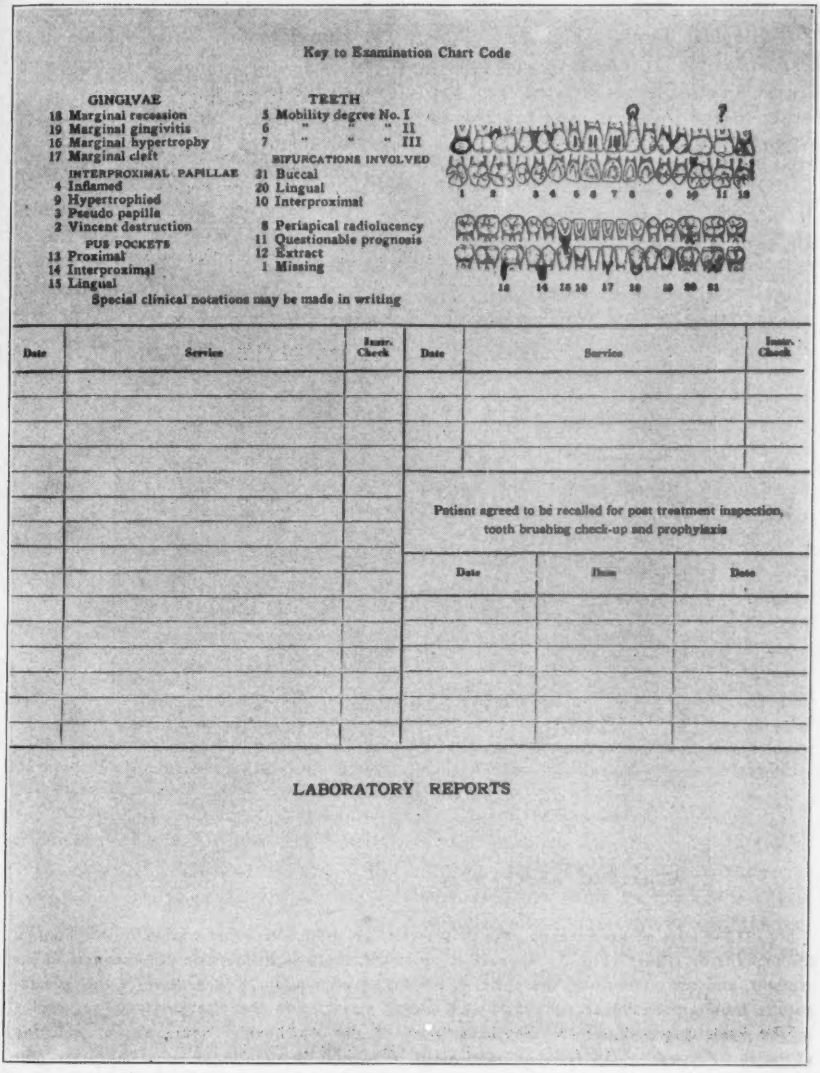


Fig. 10.—Reverse side of periodontia chart shown in Figure 9. In the original, the dental chart is printed red, while the superimposed explanatory symbols are printed in black. Twenty-one characters are employed as the use of a greater number proved impractical for teaching purposes.

6. Papilla missing (Fig. 4): Horizontal line crossing the interproximal space near the necks of the teeth.

7. Gingival fistula (Fig. 5): Pinhead size circle. If it leads to a periapical abscess, a dotted line is directed from the fistula to the involved apex marked as in symbol 10.

8. Carmichael or three-quarter crown: A continuous line following the mesioclusodistal borders of the tooth on its buccal or labial aspect in the chart.

9. Dowel tooth: Three oblique lines across the crown and a vertical one through the root.

10. Periapical radiolucency: Caret sign surmounted by a circle. While roentgenographic symptoms are generally

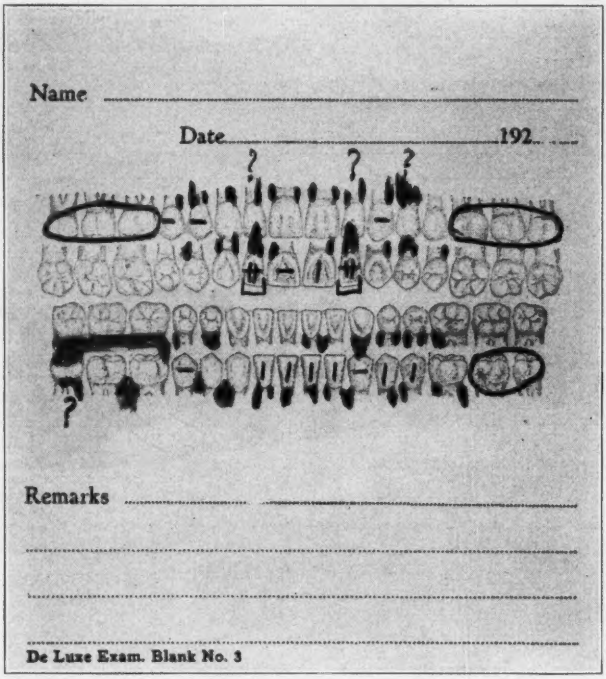


Fig. 11.—Chart of an average case in practice, of suppurative periodontoclasia. Though the explanatory chart (Fig. 1) appears complicated, there is little variety demanded in the symbols, and their recording, therefore, is comparatively simple. Registration of the pseudopapilla between the lower right first and second molars and the interproximal pus pocket in the same place illustrates the advantages of the lead pencil over ink for charting purposes. Through a difference in shading, it is possible to superimpose one character (the pseudopapilla) over another (the pus pocket). For various purposes, it is expedient during treatment to place the chart on the napkin, on the right side where it is caught by the napkin chain clamp. The clasp shown at the top serves to prevent the tearing of the chart from repeated use, as the clamp fastens over it.

avoided in the chart, this one is included because of its great prognostic importance.

11. Festoon (Fig. 3): Outline of a quarter moon with rounded ends, placed at the neck of the tooth, or it may be extended down on the root according to the degree of an associated gingival recession. Special notation should indicate whether the festoons are hard and pink or soft and of deeper color because of the difference in etiologic origin, and for comparison with future changes of the clinical picture. The inflamed festoons may be described diagrammatically by a dotted line running lengthwise through, or outside but parallel with, the festoon.

12. Porcelain jacket crown: Outline of the core preparation for a porcelain jacket crown.

13, 14 and 15. Fixed bridge: Pontic (14) attached to a shell crown (15) and resting against an inlay (13) with a lug.

14. Pontic: Three oblique lines. The horizontal line here used leads to points of attachment.

15. Metal shell crown: The crown part of the tooth entirely filled in.

16. Questionable prognosis: Question mark. This bears witness that the patient has, at the time of examination, been informed of the questionable prognosis of the tooth so marked. It also serves the operator as a guide in treatment.

17. Extruding subgingival proliferating tissue (Fig. 2): A cervical arc lined with miniature scallops.

18. Vincent's infection (Fig. 5): Caret placed interproximally over the alveolar crest to denote the "punched out" destruction of the septal gingiva. This symbol should be registered bucally, or lingually, according to clinical indications. (Compare Fig. 8.)

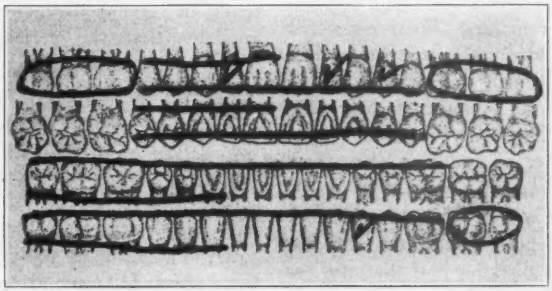


Fig. 12.—Service chart of the case in Figure 11, indicating the completion of the preliminary cleaning of all teeth and of apoxesis (subgingival curettage) of the teeth on the right side. The latter is indicated by the double line.

19. Lack of contact: Two parallel vertical lines, placed interproximally and separated according to the case. While accurate plaster casts are more authentic, this notation can, in certain instances, serve quite effectively.

20, 21 and 22. Degree of mobility: Roman numerals denoting respective degrees, designated as follows: I: Considerably greater than normal mobility. III: Greatest degree within the scope of favorable prognosis. II: Intermediate between I and III.

23. Fractional degree of mobility: A horizontal line drawn across the middle of the crown. Where no numeral is present, it denotes a but slightly greater than normal mobility. Where it is superimposed over a numeral, it denotes an additional fractional degree as in 24 and 25, which indicate, respectively, degrees one plus and two plus. While appreciable benefit may be derived from the utilization of fractional degrees by the operator who has sufficiently familiarized himself with the whole degrees, it is advisable that the use of the former be deferred by the novice.

26, 27. Mesial and distal bifurcations affected: V-shaped symbols outlining respectively the mesial and distal bifurcations of upper molars. These are noted only where a bifurcation may be reached by a probe through the gingival sulcus. The presence of suppuration here suggests, most frequently, a questionable prognosis. (See 37 and 39.)

28. Extraction recommended: An x placed on a tooth to be extracted serves the double purpose of indicating that the prognosis was negative and that the patient was so informed.

29. Clasp bridge: A pontic attached to a mesial and a distal clasp. This is best designated on the occlusolingual aspect of the chart.

30. Pinledge attachment: A triangular arrangement of three dots (representing the three pins usually employed in pinledges), the apex of which is placed at the cingulum and the base toward the incisal border.

31. Infraclusion: Horizontal line drawn on the tooth only slightly away from the incisal edge, in contrast to the similar line at about the middle of the tooth, which, as above stated, denotes a fractional degree of mobility.

32. Multiple cleft (Fig. 4): Two or more short lines branching out of a cleft.

33. Elongation: Incisal extension of the individual tooth beyond its adjacent neighbors.

34. Lingual suppurative pocket: A filled-in figure on the lingual chart. This is here illustrated to demonstrate how the diagram may, when necessary, be extended according to the approximate depth of the pocket, even into the labial chart. All pyorrheal pockets are drawn approximately according to the actual location, size and form of the lesion. (See 35, 36 and 51.)

35. Proximal pus pocket: This is drawn so as not to extend to the adjacent tooth, in counter distinction to 36, and indicates that the periodontal attachment on the other side of the septum has remained intact.

36. Interproximal pus pocket: Here the diagram is extended completely across the interdental space, indicating complete involvement of the septum, with detachment from both sides.

37, 39. Lingual or buccal bifurcations affected: Caret placed respectively at the lingual or buccal bifurcation.

38. Teeth missing in a group: An oval, including the group. This expedites the marking and facilitates the reading of the diagram.

40. Mesiodistal tilting: This is usually due to a missing adjacent neighbor. The acute angle point of the diagram is extended toward the tooth on the other side of the space, approximately to the degree of the actual condition.

41. Tooth broken down: Horizontal, sharp-angled zigzag line, the usual notation of a stump in architectural drawing.

42. Axial mobility: A short arrow on the crown, pointing apically. This re-

fers to a periodontal condition permitting a tooth to be visibly pushed, piston-like, back into its socket. This condition is frequently associated with either acute pericementitis or very advanced alveolar destruction. In the former instance, the axial mobility may rapidly diminish simultaneously with the pericementitis. In the latter, with expert manipulation, a similar though less rapid improvement may not infrequently be anticipated, but prognosis is apt to be less favorable in the hands of an amateur.

43. Marginal gingivitis (Fig. 2): A curved line completely tracing the neck of the tooth if the inflammation extends along the whole margin, or only sections of it if the inflammation is localized.

44. Symmetric recession (Fig. 4): A thin semicircular or parabolic line drawn a distance below the neck according to the extent of recession. A coexisting marginal gingivitis is designated either by making the line heavier or by a parallel dotted line opposite the inflamed section.

45. Gingival hypertrophy (Fig. 3): Arc-shaped line placed incisally to the neck in counter distinction to diagram 44 (marginal recession), which is placed apically.

46. Asymmetric recession (Fig. 4): An arc angulated to simulate the actual recession. Beginning at the point of the recession, a linear depression or an actual cleft may be frequently observed. The three symptoms, recession, linear depression and cleft, seem to be closely related etiologically. 46 also shows the symbol of a linear depression as a dotted line, following approximately the direction of the grooved line in the actual gum. This groove usually indicates a vertical alveolar destruction caused by periodontal disease. This should be differentiated from vertical interdental depressions in the gum of nonpathologic origin, usually caused by an abnormally thin labial alveolar plate.

47. Gingival cleft (Fig. 4): A vertical or oblique line, extending from the depth of an irregular arc at the neck, and corresponding to the actual cleft approximately, in size, location and direction.

48. Distended vessel (Fig. 2): A vermiform line corresponding approximately in size, position and location to the vessel presenting.

49. Toothbrush abrasion: A semicircle with the ends connected by its horizontal diameter. The latter is placed occlusally to the neck and represents the horizontal groove of the wedge-shaped concavity.

50. Cervical hypersensitiveness: A long arrow beginning at a point corresponding approximately to the sensitive place on the tooth, and directed apically. (Compare Fig. 6.)

51. Labial suppurative pocket: Filled in figure, on the labial diagram of a tooth. When gingival recession coexists with a pyorrheal pocket, the former is outlined first, from which point the latter is then drawn apically.

52. Removable bridge: An arrow underneath the pontic, pointing occlusally. The occlusoproximal angles near each side of the pontic indicate inlay attachments.

53. "Dry" subgingival pocket: A hollow figure outlining the approximate size, form and location of a subgingival pocket in which no macroscopic pus is found at the time of examination. This apparent absence of pus may be only accidental and must, therefore, be viewed with suspicion. On subsequent checking up, especially in cases previously untreated, such pockets are frequently found to contain pus.

Normalcy: The complete absence of symbols on any section of the chart indicates the absence of abnormal or pathologic conditions in that area.

RECHARTING

After the completion of a course of periodontia treatments, when the mouth is minutely examined at each periodic inspection, it is good practice to make a new chart of any remaining or newly acquired symptoms.

Such recharting is beneficial in several ways: The decided contrast between the marks shown on the new and the original charts is very encouraging to the patient and usually results in a continuance of his zealous cooperation. It also serves as a guide for any necessary follow-up treatment and as a basis for future comparison.

DIAGRAMMATIC RECORDING OF PERIODONTIA TREATMENTS

To avoid duplication in treatment or to prevent a possible omission to treat some section of the mouth, the recording of operations is presumably carried out by most if not all practitioners of periodontia, and the importance of such procedure is self-evident. The character and location of the operation is usually designated in writing opposite the date of each. While such a record serves satisfactorily to show the individual operations performed, much valuable time is lost at the beginning of each session in reviewing the written records of the work accomplished to date for the purpose of determining the next step in treatment.

To obviate such unnecessary loss of time, I find it good practice to make, soon after the beginning of treatment, in addition to the diagnostic examination chart described above, a diagrammatic service chart on which the successive steps in periodontal treatment are recorded. This informs the operator, at a glance, of the services rendered and those yet to be completed. This method is also especially advantageous in institutional work because frequently a new operator experiences great difficulty in reading the handwriting of his predecessor on the case.

The code characters are simply and quickly registered on a chart similar to the one used for the examination record (Figs. 9 and 12). A check mark on a tooth denotes that it has been ground for the correction of traumatic occlusion. A zero indicates that a tooth has been extracted either before the original examination or since then. The recording of this fact on the service chart is desirable because a tooth unmarked may be a signal for services yet to be rendered. A single horizontal line drawn across one or more teeth indicates a preliminary cleansing or partial apoxesis (subgingival curettage) and a second horizontal line, completion of apoxesis. The importance of making these notations immediately after each sitting is quite obvious.

KEY TO DIAGRAMMATIC CODE

GINGIVAE

44 Symmetric recession
46 Asymmetric recession
46 Linear depression
47 Cleft
32 Multiple cleft
11 Festoon
45 Hypertrophy
17 Subgingival proliferations (protruding)

Interproximal Papillae

4 Inflamed
5 Hypertrophied
3 Pseudopapilla
6 Atrophied
18 Destruction by Vincent's infection or food impaction

Circulatory Changes

43 Marginal gingivitis
48 Distended vessels

Subgingival Pockets

51 Labial
34 Lingual
35 Proximal
36 Interproximal
53 Nonsuppurative

Fistulas

7 Parietal
10 Periapical (or periapical radiolucency)

TEETH

1 Missing, individual
38 Missing, group
41 Root stump
28 Extraction recommended
16 Questionable prognosis
40 Mesiodistal drifting
19 Contact lacking
2 Food impaction
50 Hypersensitiveness (cervical)
33 Supraclusion
31 Infraclusion
20 Mobility degree 1
21 Mobility degree 2
22 Mobility degree 3
23 Mobility degree ½
24 Mobility degree 1½
25 Mobility degree 2½
42 Axial mobility

Bifurcation Exposed to the Probe

39 Buccal
37 Lingual
26 Mesial
27 Distal

RESTORATIONS

9 Dowel crown
12 Porcelain jacket crown
15 Metal shell crown
8 Three-quarter crown
30 Pinledge attachment
14, 29, 38 Pontics
29 Clasp bridge
52 Removable, inlay attachment bridge
13 Proximal inlay rest and lug

730 Fifth Avenue.

TISSUE DISTURBANCES CAUSED BY MECHANICAL SEPARATION OF THE TEETH OF THE DOG*

By L. B. URBAN, B.S., D.D.S., E. H. BEISLER and WILLIAM G. SKILLEN, D.D.S., Chicago, Ill.

THE effects of mechanical separation of teeth as applied in the practice of operative dentistry have apparently received little attention. Experiments were, therefore, undertaken on the dog, to determine what these effects might possibly be.

While the reactions in the tissues of the dog and the human being may differ somewhat and there may even be a possible variation in tolerance to various degrees of separation in the tissues of different individuals because of a difference in structure and resistance, it would seem, from the results of these experiments, that separation should always be undertaken with care and excessive separation avoided.

In these experiments, dental separators in common use were employed. Separation was obtained slowly and gradually, ten minutes being allowed in each instance to obtain the desired spacing.

*From the Department of Histology, Northwestern University Dental School; presented in abstract to the Chicago Section of the International Association for Dental Research, April 30, 1931.

Fig. 1.—Cross-section of tissue in 0.75 mm. separation of lower incisors of dog. *A*, gingiva; *B*, break and hemorrhage down through periodontium. The tilting of the teeth is evident.

The separator was left in place for thirty minutes and retained while the animal was killed and the tissues were fixed. Separations of 0.75 mm., 1 mm., 1.5 mm. and 2 mm. were obtained.

In all instances, the teeth undergoing

Fig 2.—Cross-section in 1 mm. separation of upper incisors of dog. *X*, area on which separator was applied; *B*, break and hemorrhage in periodontium; *C*, area of fracture of crest of bone; *E*, fibers tensed to breaking point; *D*, crushing of periodontium between tooth and bone.

Fig. 3.—Cross-section in 1.5 mm. separation of upper incisors of dog. *X*, area on which separator was applied; *C* and *C'*, fracture areas at crest of bone; *B* and *B'*, breaks and hemorrhage in periodontium; *E*, fibers tensed to breaking point; *D*, periodontium crushed between tooth and bone; *F*, points at which the tearing of fibers terminates near the fulcrum point.

Fig. 4.—Area shown at *B'* in Figure 3. *B'*, break and hemorrhage in periodontium; *G*, alveolar process; *T*, tooth.

separation and the adjacent teeth underwent a tipping movement; that is, while the crowns were driven apart, the root apices were forced toward one another. The fulcrum point was located somewhat apically of the center of the root. This corresponds to the findings of Schwarz[1]

1. Schwarz, A. M.: Ueber die Bewegung belasteter Zähne, Ztschr. f. Stomatol., 1928, p. 40.

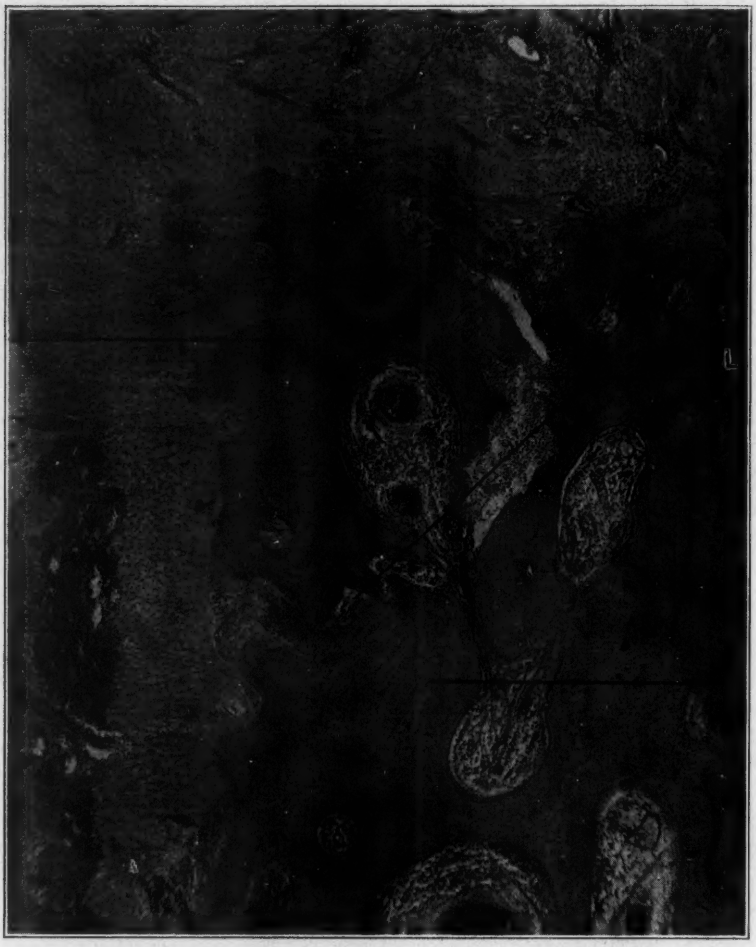


Fig. 5.—Area shown at *C'* in Figure 3. *C'*, fractured area at crest of bone *G*; *L*, line of fracture; *B'*, break and hemorrhage in periodontium.

and Klein[2] under different circumstances. The excursions of the coronal portions of the teeth varied somewhat, being dependent, apparently, on the width of the periodontium, the arrangement of the bone and the closeness of the contact points. The excursion of the coronal portion was always greater than that of the apical portion, and accordingly most of the injury which occurred was limited to the former region.

2. Klein, A.: Systematische Untersuchungen über die Periodontalbreite, Ztschr. f. Stomatol., 1928, p. 417.

The 0.75 mm. separation (Fig. 1) was obtained on the lower incisors of the dog. Subsequently, it was found that what little bone surrounded these teeth was limited to the apical region. Under these circumstances, it might be assumed that little injury occur. The results were quite to the contrary.

The teeth were tipped considerably. An extensive, irregular tearing of the fibers of the periodontium occurred, accompanied by considerable hemorrhage

Fig. 6.—Area shown at *C* in Figure 3. *C*, small fracture of the crest of the bone *G*, in the area of direct stress. (Compare Fig. 5.) *L*, line of fracture; *B*, break and hemorrhage in periodontium.

less resistance would be offered by the tissues, especially to such a relatively small separation as this, and therefore (Fig. 1*B*). The tear extended from a point in line with the cemento-enamel junction nearly the entire length of the

Fig. 7.—Areas *F* and *E* from preceding figures. The periodontium is stretched to the breaking point. *V*, circulatory vessels; *G*, bone; *T*, cementum. In some areas (*B*) the fibers seem to have already given way.

teeth. The fibers did not separate from the cementum. The tear followed an irregular line at a little distance from the surface of the tooth. The interproximal gingiva (*A*) was considerably stretched and, no doubt, was torn from its attachment to the surfaces of the teeth.

the slack in the fibers is taken up, the breaking point (Fig. 7) has been approached and only a small amount of further stress is necessary to bring this about.

The 1 mm. separation (Fig. 2) was obtained on the upper incisors. Here, as

Fig. 8.—Area D of Figure 3. *D*, compression of periodontium between *T*, the tooth, and *G*, the bone.

Such a tearing of the periodontium, under the circumstances, clearly indicates the nonelastic quality of the fibers which constitute the membrane. Probably when a more typical arrangement of the structures exists, a better idea of what might happen in the human situation may perhaps be had. Perhaps, too, this degree of

Fig. 9.—Cross-section in 2 mm. separation of lower incisors of dog. *A*, badly torn gingiva. *B*, breaks and hemorrhage in periodontium. *G*, small amount of bone between teeth. Tilting of teeth is evident.

separation is more nearly that usually sought, although there is no doubt that this amount is very frequently exceeded.

Under this separation, the tearing of the periodontium was limited to that region occlusally to the alveolar crest occupied by the transseptal fibers (*B*). The space so formed became filled with erythrocytes, the result of hemorrhage. An extensive fracture of the crest of the alveolar process occurred and a piece of bone was also torn completely away (*C*). Below this point (*E*), the fibers were stretched to the breaking point, although no actual break could be discerned. A more extensive break in the fibers of the periodontium probably was prevented by the fracture of the alveolar process.

On the side of relaxation or that side toward which the teeth moved, one tooth lay very close to the bone (*G*) in the coronal area, giving a crushed appearance to the intervening periodontium (*D*). The next adjacent tooth, by reason of the force transmitted by way of the contact points, was also tipped, the fibers becoming tense almost to the breaking point (Fig. 2*E*).

The injuries occurring here, with the exception of fracture of the bone, do not seem to be quite so severe as in the preceding case. This was probably due in part to the support offered by the contact points and in part to the giving way of the alveolar process.

Increasing the amount of separation to 1.5 mm. (Fig. 3) materially augmented the injury in many directions. Not only did the teeth to which the separator was directly applied (Fig. 3*X*) suffer greatly, but also an adjacent tooth, and to an even greater degree.

Around which tooth or teeth the greatest damage will occur seems to depend on which tissues give way first. The giving way of certain tissues about a tooth on one side of the line of separation may relieve the strain on the teeth on the opposite side of the line and, to a certain extent, limit the injury there.

Accordingly, it will be observed (Fig. 3) that most of the damage occurs about the teeth on one side (the left in the illustration) of the area under direct stress (*X*).

The fibers on which tension had been exerted tore from a point opposite the crest of the process down to the fulcrum point (Figs. 3, 4 and 5*B*), the tearing diminishing in extent toward the latter point (Fig. 3*F* and Fig. 7). This was followed by hemorrhage. Curiously enough, the most extensive and severe break occurred adjacent to the tooth distally to the area of separation (Fig. 3*B*); that is, the force was apparently transmitted from tooth to tooth through the medium of the contact points.

Nowhere did the fibers pull away from the cementum or bone. The break occurred more toward the midarea of the periodontium following in general the course of the circulatory vessels (Fig. 4 *B'*).

When a complete giving way of the fibers on one side of a tooth occurred (Fig. 3*B*), on the opposite side of the same tooth the periodontium was crushed between the tooth and bone (Figs. 3 and 8*D*). Perhaps the fact that the tooth came to rest against the bone in this way helped to prevent even more severe tearing of the tissues in adjacent areas.

Fractures of the crest area of the bone also occurred (Figs. 3, 5 and 6*C*). Curiously also, the largest fracture appeared in an area distally to the point of direct stress (Figs. 3 and 5*C*), this being the area in which occurred the most severe break in the periodontium.

Only slight injury occurred about the teeth on the opposite side (Fig. 3, right) of the area of separation.

The 2-mm., and greatest, separation (Fig. 9) was obtained on the lower incisors. The bone (*G*) here was not heavy. The teeth tipped considerably, apparently receiving no support from the contact points. No fracture of the bone occurred, but the injury created in the periodontium was most severe.

The interproximal gingiva (*A*) was greatly stretched and torn away from the surfaces of the teeth. Starting on one side of the interproximal area at the cemento-enamel junction, the break in the periodontium (*B*) extended irregularly more than half the length of the teeth. Hemorrhage was quite profuse.

With a somewhat similar anatomic arrangement of structure, the increased injury in this instance as compared to that which occurred in the 0.75 mm. separation would seem to be due mainly to the increase in amount of separation.

This study is being continued, particularly to determine what the healing process is like. Until it is completed, it is impossible to say what the after-effects of such injuries may be. But attention must be called to the fact that the injuries created here, particularly in the 0.75 mm., the 1.5 mm. and the 2 mm. separations, are similar in every way to those created in the extraction of teeth. Studies in replantation of such teeth,[3] even under the most nearly ideal conditions, indicate that a successful and lasting outcome is extremely uncertain. Therefore, we feel justified in issuing a word of warning at this time to the effect that the amount of separation should be very small and should be obtained very slowly and gradually.

3. Scheff, J.: Scheff's Handb. d. Zahnheilk., 2:718, 1924.

THE DUTY OF THE PERIODONTIST TO HIS PATIENTS*

By MAXWELL MERTON DIXON, D.D.S., Los Angeles, Calif.

FOUR hundred years ago, when the first book on dentistry of which we have knowledge was published, there was no such word as "periodontia." Even 100 years ago, dentistry was considered a purely mechanical trade. The modern science of periodontia has evolved in answer to human need.

The aborigines had no use for such science. It is the child of civilization, and though it is but in its early infancy it is a robust, quick-growing offspring, and we, the foster parents, must direct its footsteps in the path of light and understanding.

We have studied and experimented, and, as a result, we have progressed. The proof of our progress is in the discarding of antiquated ideas. No longer do we use the methods and devices of yesterday, and tomorrow our technic will be better than it is today.

Not so long ago, in the University of Edinburgh, the greatest figure of the faculty was Sir James Simpson, the discov-

*Read before the American Academy of Periodontology, Colorado Springs, Colo., July 18, 1930.

erer of chloroform. On his death, he was succeeded by Professor Simpson, his nephew, who was asked by the librarian of the university to select the books on his subject that were no longer needed.

His reply to the librarian was this: "Take every textbook that is more than ten years old and put it in the cellar."

Sir James Simpson was a great authority only a few years ago. Men came from all parts of the earth to consult him, yet almost all of his teachings are consigned to oblivion by the science of today. And this is true in every branch of science.

Fig. 1.—Teeth, in a woman, aged 36, which were condemned for extraction in 1926.

Fig. 2.—Teeth shown in Figure 1, still in a healthy condition in 1930.

So we continue our research, and by word and illustration give to each other the benefits of our discoveries and the proved application of our work. It is only natural and right that we should advance in our science, but is there not a danger that, in the pursuit of scientific knowledge, we may lose sight of what is after all the need of our patient?

True, we go on our way, saving a tooth here, relieving an abscessed condition there and making an attempt to impress on our patient's mind the need to guard against recurrence. But do we actually educate? Or is our attempt at enlightenment a feeble effort at best, and does the scarred or inflamed tissue which we are treating and the tooth which we are saving become primary and the patient secondary?

Such a thought may well startle and disquiet us. We may not like to hear it, but if such a condition exists, we should use our best efforts to eradicate it. Our first obligation, therefore, is to the health of the individual, and not to the condition of the tissue except as that bears on the welfare of the patient.

We must recognize that though we acquire our knowledge through individual and group studies, made in the course of our practice, our findings, ethically speaking, belong to humanity at large.

Are we being sincere with ourselves when we feel that we cannot tell every individual patient the state or result of

his periodontal condition, and have we any right to withhold the truth from those we serve? Are we discharging in full our duty to our patients if we keep them in ignorance because they cannot comprehend our terms? Is it not incumbent on us to speak so that the layman can understand?

Should we who have had the advantage of study and technical and professional training say to the mechanic: "Ah! Here we have epithelial nodules indicating a period of longstanding venous congestion," and expect him to understand us? Although there is available to all a great general body of in-

Fig. 3.—Appearance of teeth shown in Figures 1 and 2, in 1930.

formation, disseminated over the radio, through newspapers and in conversation, it is only recently that any authentic dental education has been available to the laymen. Heretofore, the public has had only publicity and advertisements bordering on charlatanism, at best either misleading or actually incorrect.

Because of these conditions, our task is herculean, as is all pioneering. Even though periodontia is in its infancy, we its practitioners have assumed an obligation to science and mankind which we cannot evade.

The fact that we have selected this highly specialized branch of the dental profession is proof that we are primarily and altruistically interested and concerned with the general health and synonymously with the happiness of human beings.

Our contact with each patient should, therefore, resolve itself into a study of that individual's mental condition as well as of his physical need. Our own minds must become crucibles in which human understanding and scientific knowledge and terms are melted into words that can be understood by the patient. We must show each individual what he must do to aid his own particular case. We must give him this information so clearly that he, in turn, can become a teacher and pass on his experiences to his family and friends. It is far better to furnish our patients with an intelligent idea of prevention than to rely on the distorted deductions that they may gain from guesswork. For disseminating accurate information, we have, so far, no vehicle other than personal contact and, in rare instances, the printed word.

Let us, therefore, improve the opportunities that we have in meeting our patients. We ought not only to regard each case from the standpoint of the patient, but also to consider it as a means by which we can inform and educate the public and thus help to prevent periodontal disorders and to provide a knowledge of corrective measures where an unhealthy condition already exists. Most of what the layman knows he has learned through the more or less authentic advertising of tooth paste or health food concerns. Therefore, much of our groundwork in an educational program will, of necessity, consist in tearing down certain popular misconceptions, before

there can be hope for honest cooperation from the patient.

At a recent Association meeting, it was stated that 65 per cent of all teeth extracted are lost because of periodontal disorders. If we assume that this is a fairly authentic figure, it is evident that 35 per cent covers the loss of teeth from all other dental disorders. At least one-half of the 65 per cent must be lost through an utter lack of precautionary measures or else the use of poor methods.

Unfortunately, our study cannot be based on 100 per cent of the teeth lost, as a large number of persons still do not consult dentists, and the number of people with whom the periodontist comes into professional contact is small indeed in comparison with the number of those so afflicted as to need our services. If the majority of the people are ignorant, or neglectful of the measures necessary to prevent and eliminate periodontal disease, the specialist must assume the responsibility in order that the public may be so enlightened as to check this unnecessary loss.

The periodontist who is entrusted with the care of teeth must have the cooperation not only of his patient but of the general dental practitioner as well. If a dentist wishes to retain the confidence of his patient, he must be honest enough to admit his limitations. When he finds himself unable to cope with periodontoclasia, he should send his patient to a capable periodontist. The two should work together with a healthy mouth as a final objective for their patient.

Cooperation between the dentist and the periodontist is of the greatest importance, in fact, it is absolutely necessary. The work, to be successful, hinges almost entirely on the unified functioning of the two. In many cases, the patient reaches the specialist through his dentist's recommendation, and it is a sorry thing that this recommendation is oftimes a last resort.

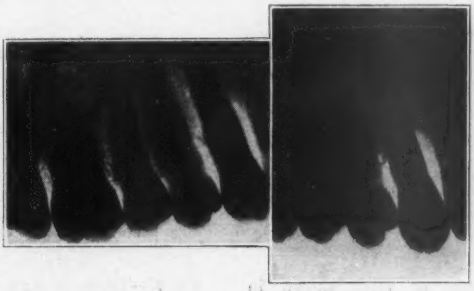


Fig. 4.—Left: Teeth, in a man, aged 47, which were condemned for extraction in 1927. Right: Teeth in 1930, still giving service.

The general practitioner in dentistry should be alert to recognize periodontal conditions when the patient first comes to him for observation, and if he cannot cope with such conditions, he is morally obligated to refer the patient promptly to the specialist who can do so. After the tissues are healed, it is a simple matter of duty on the part of the specialist to send the patient back to his dentist for treatment.

As it is now, the periodontist is confronted with an almost unanswerable question, and one which we cannot hope to answer intelligently as the few existing precedents cannot well be cited as fixed guides. I allude to the all-important question: Should the periodontist send the patient back to the dentist who has allowed a case of long standing, and, in many cases, of tragic consequences, to persist either through carelessness or ignorance, when it could have been arrested at an earlier date had the dentist sent the patient to the specialist; or is it the duty of the periodontist to direct the patient to a dentist whom he knows to be both competent and honorable in every way?

Fig. 5.—Appearance of teeth shown in Figure 4 (1930).

Fig. 6.—Tooth, in man, aged 57, which was condemned in 1920 to extraction.

To be faced by this question creates an unpleasant situation for the periodontist, but is a condition that can be met only by bringing the facts to light. That is the first step toward finding the cure for this regrettable but recurring problem.

It should not be necessary for one man to point to another and say: "Sir, you have not fulfilled your duty to your patient." Every man connected with the dental profession should look well to his own methods to see whether, through lack of knowledge or neglect, he is failing to render the highest service to his patient. The dentist and the periodontist must acquire the necessary knowledge, and apply the technicalities of the dental profession with the common-sense and honor used in ordinary business or social contacts.

I am reminded of a case in which, because of poor teeth, a patient's health was at stake. On consulting his dentist, he was given an examination and was told that there was nothing the matter with him. His physician then sent him to a periodontist, who prepared a chart showing the patient the existing condition of his mouth. A consultation of the dentist, physician and periodontist was held. When presented with the chart, the dentist admitted that the findings of the periodontist were new to him, and he was reprimanded by the physician for his hasty diagnosis and neglect. Needless to say, the dentist lost the patient, and the proper treatment given by the periodontist assisted greatly in restoring the patient to health.

This is one of the few cases in which the blame was borne by the one at fault, but think how many people there are who do not consult all three, physician, periodontist and dentist, and think also how many cases are lost through hasty or incompetent diagnosis and how many teeth are lost unnecessarily. Let us con-

sider, too, the fact that human lives are lost this way. At this time, we can truthfully say that the eyes of the world are on the mouth. One of the first things that a physician does when a patient comes to him is to look at the teeth, and, in many cases, any faulty condition of the mouth must be corrected before the medical man will go on with his part of the work. People are becoming more interested in the care of the teeth. The growth of general knowledge is our greatest assistant. We must stand ready to do our part.

It may be that, in the future, there will be specialists who will devote their efforts to diagnosis and prognosis. They will direct the patient to the specialist

Fig. 7.—Tooth shown in Figure 6, in excellent condition in 1930.

best fitted to deal with his particular trouble. Today, it is necessary that every dentist assume his responsibility as consultant for every patient with whom he comes in contact. It is his duty to advise the proper treatment, or to send the patient to the one who can give such treatment as is necessary to save teeth and preserve general good health.

We must not lose sight of this real issue, the matter of our professional responsibility to our patients and to each other as periodontists, by losing ourselves in a misinterpretation of the term "ethics."

Webster defines "ethics" as "the science of human duty." Can we find a better definition?

Webster did not say that ethics was the duty of one bricklayer to another, nor did he say it was the duty of one dentist to another. It is the science of human duty. In its simple profundity, this definition is too apt to be misunderstood. The science of human duty as applied to dentistry is the full and honorable discharge of our duty, first to our patients, then to each other.

This responsibility to our patient must be the foundation of our ethics. Scientific knowledge is based on discovered truth. Therefore, we are only ethical

Fig. 8.—Tooth, in man, aged 57, which was condemned in 1920 to extraction.

when we are true to our own best knowledge and to his actual needs, and we can execute our obligations to our patient and to each other in only one way—the way of truth. Many of our problems would vanish like magic were we to unite truth and honor with knowledge and skill in our dealings with the layman. This is a worthy goal toward which to strive.

In the words of J. William Lloyd: "There is but one virtue, to help human beings to a free and beautiful life; but one sin, to do them indifferent or cruel

hurt; the love of humanity is the whole of morality. This is goodness, this is humanism, this is the social conscience."

It is not untimely to urge a closer relationship between those engaged in the practice of medicine and those in the field of dentistry. Thus would the factors in health improvement be augmented. At present, this is a personal problem and responsibility. We should seek as individual beings to better our understanding of all the branches of medicine and to promote closer affiliation among practitioners in the dental and medical sciences. Individual action will lead, in time, to concerted action, and this will hasten that millennial dawn when all will work together for the good of each.

Fig. 9.—Tooth shown in Figure 8, still giving service in 1930.

In our study of dental history, we learn that savage tribes through the ages subjected healthy teeth to many forms of mechanical alterations for religious or ornamental purposes. In this enlightened day, it is a disgrace that there should be cases in which teeth and tissue have been mutilated and destroyed through ignorance or carelessness and neglect by the patient or the practitioner. The dental and medical sciences have made greater advances in the last fifty years than ever before, as has all mankind. For centuries, man was an earthbound creature; now modern invention has given him wings. Man today is free of many of the chains which bound him yesterday.

In adjusting our technic to the needs of man, the first step is to turn the piercing rays of honest criticism on our own daily practice and habits, and to ask ourselves: "Am I assuming my full share of responsibility to my patient, to my Association and to the discovery of truth through research?" And having asked that question, let us not be satisfied with half an answer. If we cannot answer "Yes" to each of these questions, let us begin by honest criticism of ourselves.

With Arnold, we must recognize that it is criticism which recognizes no posi-

Fig. 10.—Appearance of tooth shown in Figures 8 and 9 (1930).

tion as final, which refuses to bind itself by the shallow shibboleths of any sect or school, that creates that serene philosophic temper which loves truth for its own sake, and loves it not the less because it knows it to be unattainable.

To give you plain facts, which I believe must be recognized without delay by the entire dental profession, the health of each individual depends upon the diagnosis of the dentist, and that diagnosis must be complete. It must encompass all branches of our profession. Should a patient first consult a perio-

dontist, the latter's responsibility is not only to correct periodontal disease, but also to see that his patient gets to some one who will make any restorations necessary, and vice versa. No restorations of any kind should be made in a mouth until the best roentgenograms obtainable have been examined to ascertain existing conditions surrounding these teeth. When each dentist takes this responsibility on himself, the honor of restoring health to a very large percentage of humanity will go to the dental profession. If we do not fit ourselves to relieve human ills in this manner, it will be necessary for the medical profession to perform this duty for us, which they will be very glad to do, should we neglect it.

The periodontist's responsibility to his patient is to give the best possible service. All of the teeth shown in the accompanying illustrations were condemned for extraction, but, after treatment, are in a healthy condition and giving the patients good service.

Fig. 11.—Tooth condemned for extraction in 1913; in a woman, aged 30.

Fig. 12.—Tooth shown in Figure 11, still giving service in 1930.

Fig. 13.—Tooth referred to in Figures 11 and 12 (1930).

Fig. 14.—Teeth, in a woman, aged 30, which were condemned for extraction in 1917.

DISCUSSION

Olin Kirkland, Montgomery, Ala.: I should like to ask Dr. Dixon what technic he employs in accomplishing these excellent results.

Dr. Dixon: I use anything I can get results with. It is necessary in practically all these cases to clean up the cementum and clean off the bony process. I clean off the alveolar process, under anesthesia at all times. Unless we insist on a healthy condition and have a functioning tooth, a healthy tooth, we accomplished nothing. Many of those teeth were condemned for extraction. It is the responsibility of the periodontist to assure the patient a healthy condition around these teeth and to make them serviceable. How long they will stay that way, we don't know, but I have

had one remain so since 1913, several since 1914 and 1916.

Arthur H. Merritt, New York City: Do you excise the gum or cut it in any way?

Dr. Dixon: Sometimes I do and sometimes I do not. Nature is very good to us. Light mechanical treatment helps us out a good deal.

Justin D. Towner, Memphis, Tenn.: Dr. Dixon emphasized the responsibility of the periodontist to his patient as regards referring the patient back to the former dentist, perhaps the dentist who referred the patient to him originally. In the case where the periodontist feels that the dentist was not competent to treat the patient properly, I should like to have Dr. Dixon tell us (because it is a very important problem) just what his attitude would be.

Fig. 15.—Teeth shown in Figure 14, still giving service in 1930.

Dr. Dixon: That is a serious thing confronting the dental profession and especially the periodontist today. It is a sad thing to get a mouth in good shape and then have somebody spoil everything that we have done. A dentist can put in an inlay or something else that will undo all our work. It is a question what to do with these cases.

Dr. Towner: When I began specializing in periodontia, I was confronted with this problem, and I disagreed with several dentists so decidedly that I had to make a statement concerning it. I went before our local group when we had a large attendance and stated my position, which was this: The restorative part of the treatment of periodontal tissues was so important that the man who undertook the periodontal treatment *per se*, the instrumentation, etc., should dictate the restorative process and who in his opinion was capable of handling it, on account of his obligation to his patient. I told them that I should like to declare myself in that respect in this way, that I wanted them to understand that I did not ask references, and in case they sent me references, I wanted them to know that I appreciated it very much and considered it a compliment to my judgment and skill; but, at the same time, I wanted them to tell that patient goodby, because if they expected me to be responsible for the health of the periodontal tissues, I expected to manage the case, and if I was chosen to do the restorative work in the group associated with me, I expected to do it. If they felt somebody else was more capable of doing that particular piece of work, the patient would be referred to that particular man. Thereafter I had no trouble at all. The question has never arisen from that day to this, possibly fifteen or eighteen years.

Fig. 16.—Appearance of teeth shown in Figures 14 and 15.

INFLUENCE OF ORTHODONTIA ON THE TREATMENT AND PREVENTION OF PERIODONTAL DISEASE*

By HENRY F. HOFFMAN, D.D.S., Denver, Colo.

THIS paper is presented in the hope that it will prompt discussion and encourage closer cooperation between two interdependent specialties in dentistry, orthodontia and periodontia.

An examination of the literature regarding the relationship of these specialties reveals that but little has been written and that there has been but little discussion of this subject. Notwithstanding its importance, this seems to be practically virgin territory.

The orthodontist frequently seeks the aid of the periodontist for correction of periodontal disease incurred before, and to maintain the health of the periodontal tissues during and following orthodontic treatment. Too little appreciation has been given the assistance which either specialty can render the other in insuring a more valuable service.

It is the purpose of the orthodontist to assist Nature in the development of the structural elements of the jaws in order that normal functional activities may be established. We have no definite rule as to what constitutes the normal for any given individual, but variations from type are normal to each individual and offer limitations to the degree of perfection which can be attained by the orthodontist.

These variations or individual conditions are not to be ignored and on the ability of the diagnostician to detect them depends the value of the prognosis. Among the most evident of these individualities are: (1) inharmony in tooth and arch sizes; (2) congenital absence of teeth; (3) malformation of teeth, and (4) physical or mental conditions which interfere with the control of the patient.

Individualities or variations from type have been defined by A. LeRoy Johnson[1] as presenting a condition called the individual norm as differentiated from the ideal norm and calling for correction in harmony with the inherited individual conditions presented.

Considering the very small number of dentures which closely approach in every respect the ideal, we can, following this theory, say that there should be an individual norm for most of our patients.

The judgment of the operator as to what should constitute the individual norm for any person then becomes extremely important, particularly in the light of the modern conception of orthodontia; namely, that the treatment and permanent result obtained are primarily a biologic problem rather than a mechanical one.

This explains why many treated orthodontic cases do not present the ideal re-

*Read before the American Academy of Periodontology, Colorado Springs, Colo., July 17, 1930.

1. Johnson, A. L.: Basic Principles of Orthodontia, Dent. Cosmos, 65:379 (April), 503 (May), 596 (June), 719 (July), 845 (Aug.), 957 (Sept.) 1923.

sult desired, because of individualities rather than poor treatment.

However valuable and important the recognition of this principle may be, its abuse is to be feared. The orthodontist should not offer the excuse of the individual norm as an alibi for failure to do his part. Many seemingly impossible cases yield to a second or more prolonged treatment.

The recognition of these individualities and of the biologic problem in orthodontia should result in increasing accuracy in diagnosis and prognosis, to the great advantage of the patient and the operator.

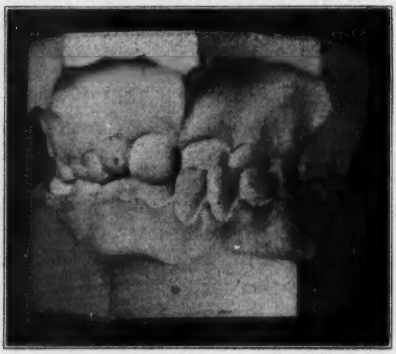


Fig. 1.—Thinning or loss of labial alveolar plate when teeth are labially to the arch.

These problems of the orthodontist also confront the periodontist, and their recognition and early detection will go a long way toward determining the degree of success attending periodontic treatment. I refer particularly to arch shapes and tooth arrangement, either as presented or from the standpoint of the final orthodontic result, and to tooth form as related to cleaning and to tissue protection.

Time prohibits a detailed presentation of the many types of malocclusion which tend to induce periodontal disease and to interfere with the efforts of the periodontist in treatment or prevention.

I shall call attention briefly to a few of the common conditions encountered in which satisfactory treatment or prevention can hardly be expected without orthodontic assistance and to some conditions in which orthodontic treatment has definite limitations.

A condition to which Isador Hirschfeld[2] has called attention is frequently seen even in very young patients. This consists of the thinning or entire absence of the labial alveolar plate when a single tooth is labially to the arch. This (Fig. 1) most frequently occurs in mandibular incisors, particularly when an incisor is in labial occlusion with the maxillary teeth. Correction at the earliest possible time is indicated.

A similar condition is seen in Fig. 2, left, at 8 years of age, and, right, at 14 years of age, three years after completion of treatment, showing the gingival border on the lower left central below the dentino-enamel junction. The absence of this labial plate produces a potential seat of periodontal disease.

One of the most hopeless conditions for the periodontist to combat is an extreme overbite of the anterior teeth. (Fig. 3, left.)

This is a case of a woman, 20 years of age. A pocket and fistula already existed on the upper left central incisor. (Fig. 4, left.) Treatment by R. A. Adams followed by correction of the overbite (Fig. 3, right) resulted in a cure which should be permanent with reasonable care. Figure 4, left, shows the roentgenogram taken at the time of operation and, right, that taken later.

2. Hirschfeld, Isador: Periodontist's Appreciation of Orthodontia, Dent. Cosmos, 66: 725 (July) 1924.

This type which is frequently encountered, is one which should be detected and treated at a much earlier age. Successful treatment of such cases for adult patients is rare and depends for success as much on the favorable individual conditions presented as on the operator and the patient.

Another type presented is that in which the bicuspids are rotated a quarter turn (Fig. 5, left). This condition presents everything faulty in interproximal contact. When these patients finally come in for periodontal treatment, the case is about hopeless, for no effort can restore normal function. Figure 5, right, shows

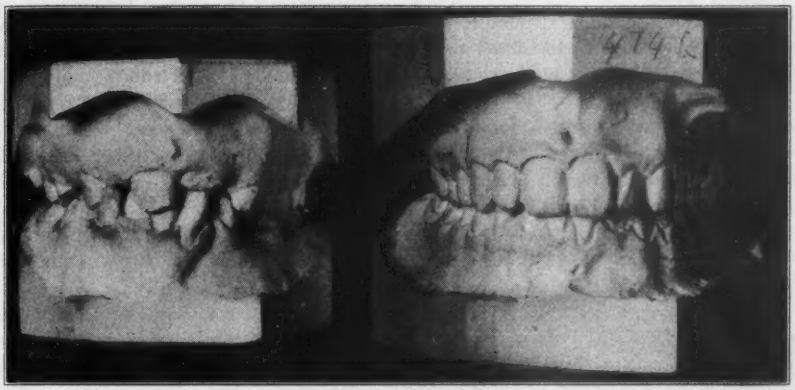


Fig. 2.—Left: Lower incisor labially to the arch with loss of labial alveolar plate, in a patient, aged 8. Right: Three years after correction. The alveolar plate is not restored.

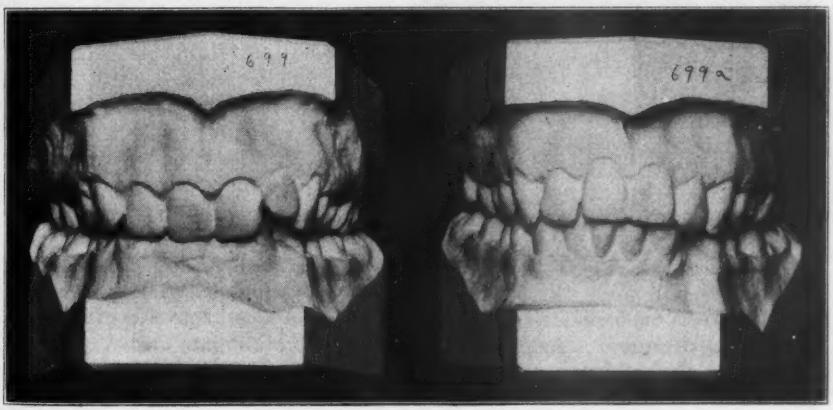


Fig. 3.—Left: Extreme overbite of anterior teeth, the lower incisors striking the soft tissues lingually to the upper incisors. Right: Overbite corrected.

a roentgenogram of the condition in this case. Destruction of interproximal tissue is well under way.

The rotation of these teeth should be accomplished during or immediately after eruption because, at that time, rotation and retention are simpler, the interproximal spaces can best be closed and normal interproximal tissues can only develop then.

Figure 6 shows a distal occlusion of the mandible, with protrusion of the anterior maxillary teeth and contracted arches. The patient was a mouth breather with adenoids. I show this case to illustrate the effect of function or lack of function on the periodontal tissues. The hyper-

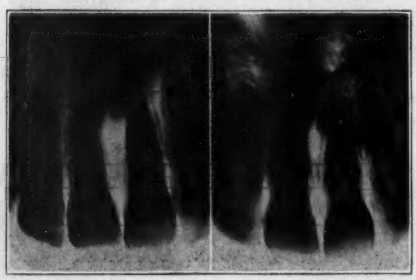


Fig. 4.—Left: Periodontal abscess on upper left central incisor caused by overbite. (Fig. 3.) Right: Restoration of alveolar tissue following periodontal treatment and correction of overbite.

trophied cervical tissue (left) presented an even worse condition after two years' orthodontic treatment (center), because of a further loss of function from interference of appliances. At this time, all appliances which interfered to any extent were removed. The condition five years later is shown on the right. This case received no periodontal treatment, the change in the tissues being due to a practically complete restoration of function. Doubtless this case would have been still further improved by periodontal treatment.

A condition which appears to be similar to the original condition in this case was shown by Hirschfeld and termed by him "mouth breathing gingivitis."

Such cases need periodontal treatment after orthodontic treatment, but no amount of skill in periodontia can restore normal conditions without orthodontic assistance.

Figure 7 illustrates a type frequently encountered in which the lateral incisors are rotated. Without orthodontic correction, these interproximal spaces are always a battleground, and usually with periodontal disease the victor.

Among the conditions in which orthodontic treatment has definite limitations are those in which definite spaces exist between the teeth (Fig. 8). These cases try alike the mettle of the orthodontist and of the periodontist. The explanations we have for this today are inharmony in arch and tooth sizes and enlarged tongues. Orthodontic efforts to close the spaces usually prove unavailing.

The interests of the patient and the cooperative efforts of the periodontist are best served through enlarging the larger spaces, thus closing the smaller ones, and retaining with substitutes.

A knowledge of biologic laws which would enable us to diagnose these cases correctly before undertaking treatment would be a boon to our patients and save much embarrassment. Our present diagnostic limitations have to be reckoned with in deciding on methods of treatment in these cases of obscure etiology.

We are frequently confronted with a condition due to the congenital absence of the second bicuspid. The retention of the second deciduous molar when the second bicuspid is congenitally absent is usually regarded as a boon. This is a condi-

tion which should receive the special attention of the periodontist, for these second deciduous molars seldom support normal interproximal tissue in the adult denture.

The vertical development of the alveolar process which accompanies the eruption of the permanent dentition is dependent on the eruption of the teeth, and there is not the same vertical development of the alveolar process supporting deciduous teeth as for that supporting the permanent teeth (Fig. 9).

junction of the deciduous tooth is much deeper cervically than is the dentino-enamel junction of the approximating permanent teeth (Fig. 10), a pocket resulting with which the periodontist finds it difficult to cope.

However important it may seem to retain these teeth, for young patients, they should nevertheless be sacrificed in later years whenever they show evidence of becoming the seat of pathologic conditions.

Traumatic occlusion has for some time received the serious consideration of the

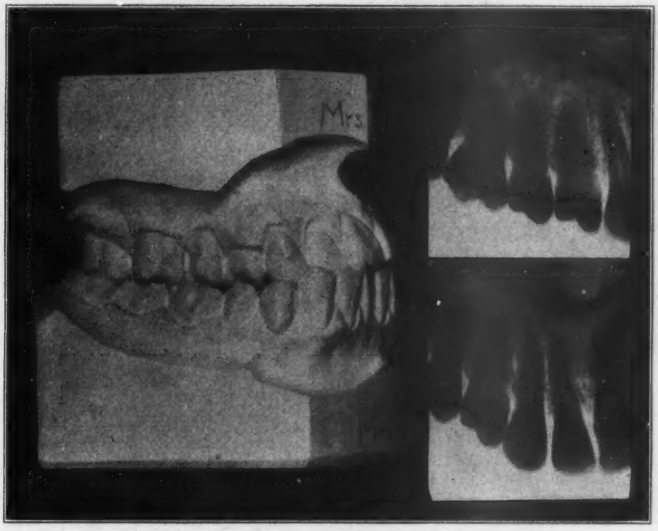


Fig. 5.—Left: Upper bicuspids rotated a quarter turn. Right: Pockets formed as a result of faulty interproximal contacts.

Since the occlusal plane of the deciduous teeth is cervically to the occlusal plane of the permanent dentition, or, in other words, the deciduous molars do not erupt to the occlusal plane of the permanent dentition, the deciduous molar is frequently out of occlusion. When this occurs, as it frequently does when a second deciduous molar is retained, the dentino-enamel

dental profession, and particularly of the periodontist, and is now accepted as a vital factor in the cause of periodontal disease. Orthodontic treatment, in my opinion, should be considered as having limitations in the correction of traumatism.

The general aim of orthodontic treatment is to place the teeth in as nearly an

ideal arch and occlusal plane arrangement as is feasible. Such a procedure, although accompanied in theory by bone development in harmony with the altered arches, is in fact seldom accompanied by many times results in a malocclusion, often sufficient to produce traumatic occlusion in later years.

Anatomically correct or normally functioning occlusion seldom results from or-

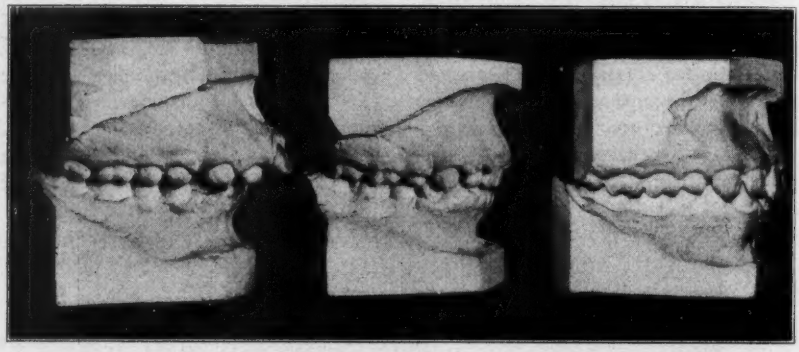


Fig. 6.—Left: Hypertrophied cervical tissue in adenoidal mouth breather. Center: Increased hypertrophy of cervical tissue following treatment; due to further loss of function from interference of appliances. Right: Cervical tissues normal five years after complete restoration of function.

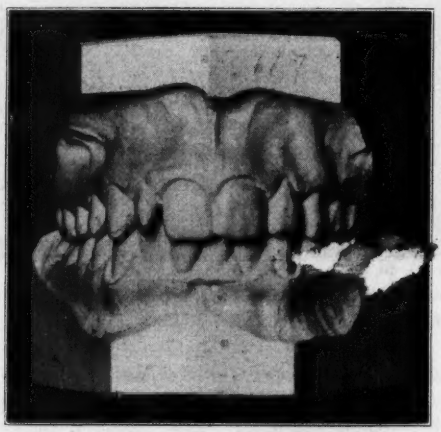


Fig. 7.—Rotation of lateral incisor resulting in loss of normal interproximal contact.

a sufficiently ideal bone development to support the teeth in the proper inclined plane relations of the occlusal surfaces. Hence, the treatment for malocclusion thodontic treatment of extreme malocclusion. True, alinement, interproximal spacing and occlusion are greatly improved, but the inclination of the long

axes of the teeth is frequently far from normal, cases of mesial and distal inclination abound and, from the standpoint of perfection of cusp relations, much is yet to be desired. It is here that the services of the competent periodontist can aid in, and often complete, the work of the orthodontist.

When orthodontic treatment is carried out during the period of development of the dental arches and with normally functioning developmental forces, the orthodontic result most nearly approaches what may in all respects be considered a normal occlusion. But any deviations from these ideal conditions of treatment will generally disturb the occlusal planes beyond the possibility of producing a normal occlusion by orthodontic means alone.

In such cases, the nearest approach to normal occlusion is reached only with the help of the periodontist or one skilled in correcting traumatic occlusion. The judgment of the experienced operator is often severely taxed to determine just where correction for traumatism is desirable.

It is my belief that the following elementary rules should apply in the correction of traumatic occlusion following orthodontic treatment:

1. In general, orthodontic treatments cannot be considered complete for from three to ten years after treatment.

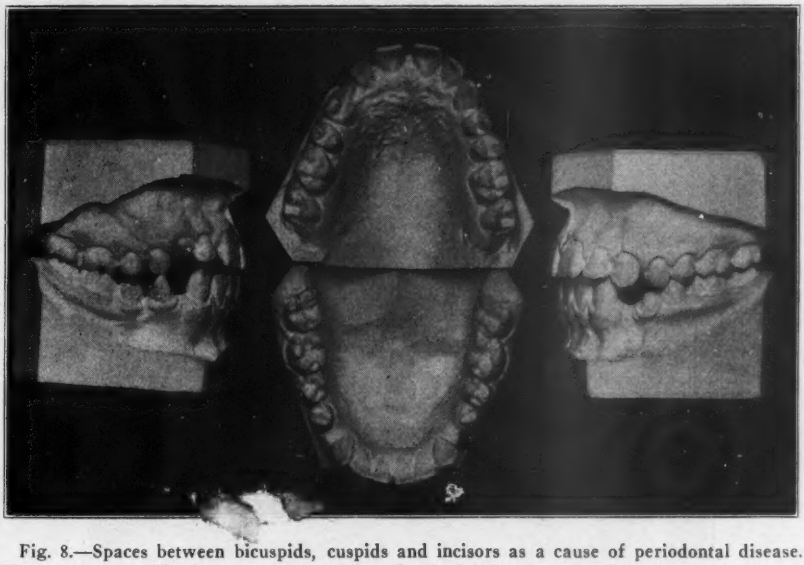


Fig. 8.—Spaces between bicuspids, cuspids and incisors as a cause of periodontal disease. These cases are difficult to correct by means of orthodontic treatment alone.

2. In young patients, the restoration of function can be expected to correct many faults in occlusion, and mild traumatism which will not tend to a relapse to the original conditions should be allowed an opportunity to correct itself.

3. Sacrifice of tooth substance in young patients should always be looked on with disfavor and as a last resort.

The value of cooperation between the specialties of orthodontia and periodontia in the correction of traumatism will not be generally appreciated until such time as the orthodontist, realizing the necessity and value of such interdependence, conveys in some manner to the patient at the time of taking the case the possible future need for the cooperation of the periodontist if the best results are to follow orthodontic treatment.

In just this way, many orthodontists are now safeguarding against future third molar complications, and I believe it is reasonable to expect that, in the not far distant future, the need for correcting faulty occlusion resulting from or following orthodontic treatment will also be

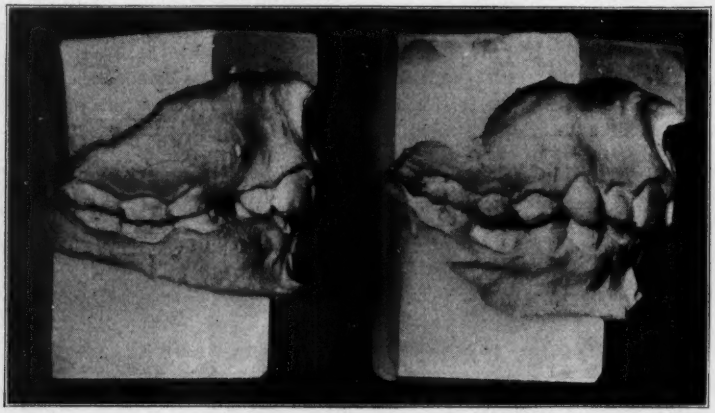


Fig. 9.—Left: Lower second bicuspid congenitally absent; second deciduous molar retained. Right: Two years later, showing lack of vertical development of tissues supporting second deciduous molar.

Fig. 10.—Left: Lower second bicuspid congenitally absent; second deciduous molar retained. Right: Dentino-enamel junction on deciduous molar cervical to dentino-enamel junction of approximating permanent teeth with lack of development of interproximal tissue, causing pockets.

provided for before beginning treatment.

It is difficult for the orthodontist, after completing orthodontic treatment, to explain to the patient the need for the services of another specialist to complete the successful work of the orthodontist unless the way is paved for this before starting treatment.

I have shown some of the difficulties of the orthodontist merely to explain that, although orthodontia is a vital factor in controlling periodontal disease, there are limitations with which orthodontia is today unable to cope. Nevertheless orthodontia is a vital factor in the prevention and control of periodontal disease, without which the efforts of the periodontist are handicapped and often thwarted.

PARTNERSHIP BETWEEN THE PUBLIC AND THE PROFESSIONS*

By MICHAEL M. DAVIS,† Chicago, Ill.

DENTISTRY cannot solve its scientific problems alone. The foundation of dentistry is not in the technic of handling instruments nor in the manner of performing operations while the patient is in the dental chair. Dentistry rests upon science. Behind its procedures lie the biology and physiology of the growth of mouth and teeth, and the chemistry, bacteriology and pathology of tooth decay and of other oral changes. Upon studies of dental growth, decay, immunity and other fundamental problems, the future development of dental service will be largely based. In these studies, the dentist cannot proceed without the continuous cooperation of the chemist, the biochemist, the physician, the bacteriologist and others. In universities and in dental colleges and associated institutions, these matters must be studied through organized team-play among scientists.

An even broader need for cooperation exists in medicine. The most transforming scientific discoveries affecting medicine in modern times were made by the chemist Pasteur. The medical sciences have become interdependent with physics, chemistry, biology and even psychology, in investigating many of their major problems.

Medicine and dentistry not only face the scientific tasks of discovering new facts and of making fresh interpretation of old ones: the present day presents them also with problems in economics and organization. Medicine and dentistry are professions of which the public expects more and better service to more people. The past history of these professions has given the public a right to expect this. Professional leaders accept it as a responsibility. There are several million people in the United States today who live in rural sections where they can get medical service only in the gravest emergencies, because it is distant and they are poor. There are thousands of people in every large city who have

*Read before the Section on Dental Economics at the Midwinter Clinic of the Chicago Dental Society, Feb. 3, 1931.

†Director for Medical Services, Julius Rosenwald Fund.

doctors, dentists, hospitals close to their door, but who secure scanty service because they lack the knowledge or the courage to find it or the money to pay for it. There are millions of people both in cities and in country towns who go to healers, quack doctors and quack dentists, who buy tons or gallons of medicines and who waste altogether half a billion dollars or more a year on these futile expenditures. Almost every month our magazines contain articles criticizing for its high cost medical or dental care. Almost every week, the desks of the editors of professional journals bear letters from subscribers who complain about these lay complaints, and who are themselves dissatisfied with existing conditions of practice.

The financial burdens of sickness are very unevenly distributed throughout the population. Sickness from its very nature falls uncertainly and cannot usually be foreseen. About one-sixth of the population in any given year has to bear about one half the total expense. The complaints of the "white-collar" people about the "costs of medical care" arise chiefly because of this unexpected and unforeseeable advent of high-cost illness. This affects only a small proportion of the people every year, but they are the ones who raise their voices. The professions responsible for furnishing service have not solved the problem of so distributing this uneven and uncertain expenditure as to enable the paying power of the average family to meet the financial demands of needed health service.

Preventive work in medicine and dentistry is poorly supported. The people of the United States spend annually about $30 for the cure of sickness and defects to every $1 for organized preventive work. Our present knowledge of the prevention or control of certain diseases is so insufficiently applied that we still have in this country several hundred thousand cases a year of smallpox, hookworm, malaria, diphtheria, typhoid fever and other diseases, which could practically all be wiped out at an immense saving of suffering and money.

Some physicians complain that the continued growth of hospitals and clinics is interfering with their individual private practice. Some hospital patients declare that the service they receive is impersonal and mechanical as well as costly. Some physicians agree that there are too many specialists and no adequate standards controlling the qualifications of specialists. Patients complain that going the rounds of a number of uncoordinated specialists in private offices is expensive and confusing, and that if they secure coordinated service in well-organized clinics, they must in most instances sacrifice their self-respect by accepting this as a charity. The public's demand for various forms of medical service is not wisely directed. Two thirds as much money is spent on useless medicines and appliances as on the services of physicians. Only a fraction of the people seek dentists, except in emergencies. Probably more than $100,000,000 is expended every year on quacks. How can the popular demand be made more intelligent and discriminating?

Certainly it has become clear that widespread dissatisfaction exists with present conditions among both the people who receive and pay for health service and the professions which furnish it. More than 200,000 persons are included in the medical and dental professions. More than 120,000,000 persons constitute the public.

Are the interests of the producers and the consumers of health service as widely divergent as their numbers? As far as

the interests of producers and consumers differ, how can these differences be resolved? Differences affecting scientific professions should not be settled by the conflict of clashing forces, as some issues between capital and labor have been. How shall conflict be avoided? Cannot problems be worked out by the application of intelligence rather than of emotions? Can the technical and financial problems which cause dissatisfaction and complaint among both consumers and producers of medical services be solved by either group acting alone? In what matters are joint consideration and joint action required? And how can they be brought about effectively?

There are three kinds of problems in connection with medical and dental care: 1. Professional problems: the scientific standards and technical methods of rendering service. These matters, i.e., the methods of diagnosing and treating disease, are wholly for the physicians, dentists and allied groups. 2. Economic problems, concerning the costs of medical service and the interrelations of medical service with the general economic system of present society. Other public aspects than the economic are also involved —the legal, for instance, with its important bearings on the status of practitioners and institutions. 3. Joint problems, in which professional and economic problems are mingled. This is the case, for example, in those numerous phases of hospital administration wherein business and medical aspects must be dealt with together, and in most of the problem of preventive work and of medical organization, involving, as they do, the relations between consumers and producers of health service.

Practitioners and hospital administrators face these problems as producers rather than as consumers of medical service, and not a few of them seem to think that they know the exact answer. Wingate M. Johnson, for instance, a practitioner of North Carolina, expresses the views of many such professional men in his article in the *Atlantic Monthly* for March, 1931.[1] The indigent who can pay nothing must be furnished medical care, but let this care be paid for by the public treasury or by private philanthropy. Let those who are not indigent pay; and let them pay in proportion to their means. Let them seek and cleave to a family doctor and receive service from hospitals and specialists only through him, and let them depend on their family doctor to fix rates which will be fair and in accordance with their paying ability. In a word, let the indigent be provided medical care through public or private charity and let all the rest of the people be cared for under the sliding scale administered by physicians, or by hospitals under physicians' direction.

In other words, the sliding scale of charges, adjusted by the practitioner to what he thinks is the ability of his patients to pay, is a panacea, if it is assumed that the indigent are cared for out of organized charity and the rest of the people have a family doctor of the kind that Dr. Johnson visualizes. The consumer is to trust the producer to fix both the quality and the price of the service. In the case of medical care, this may imply placing in the family physician's hands both one's life and one's pocketbook. Many patients have done this very thing and have not suffered thereby. But

1. This article appeared subsequent to the delivery of the address, but furnishes so appropriate an illustration of the point made that it has been included in the revision of the address for publication.

will the program bear general application?

The fact is that, in former days, just such a program was actually in existence. What has happened since is that the trend of medicine and dentistry has been in another direction. Medical services (including medicine, dentistry and nursing) have become highly specialized and complex. A much greater proportion of the population live in the cities, and they are able to obtain medical service more readily and over a much wider range than formerly through the telephone, the automobile and the increasing accessibility of hospitals and clinics. Dr. Johnson's formula is much too simple to fit the very complex situation of the present day. The formula has had its chance, in fact. We have been moving away from it, not toward it. If it worked or could work at the present time on any large scale, we should not be here today discussing this subject.

Dr. Johnson's panacea fails to take into account certain important bodies of facts. For example, he assumes that the indigent are to be cared for by charity. But who are the indigent? Estimates made in 1929 in New York City indicated that out of a population of 6,000,000, there were, outside of institutions, about 150,000 persons who were receiving aid from the chief organized charitable agencies. This group was not merely "poor"; they had been investigated by responsible charitable organizations and were known to be poor. These were the "certified" poor. Under Dr. Johnson's program, they would probably be called the worthy indigent. Under Dr. Johnson's program, these are the only ones to receive medical service free, if we take a strict definition of his terms.

As a matter of fact, the great proportion of the population of the United States are not indigent, nor poor in the proper sense of the word: they are self-supporting in normal times. This is illustrated by the fact that, during the same year, 1929, it is estimated that approximately 1,000,000 people in New York City received some medical attention in clinics, and there were undoubtedly several hundred thousand persons besides who were furnished physicians' services free and care in hospitals free or nearly free. This merely demonstrates the oft-repeated truth that whereas only a very small proportion of the people in American cities do not meet their regularly recurring expenditures for food, shelter, clothing and ordinary incidentals, there is a much larger proportion who do not carry the expense of the unusual and unpredictable event of illness, particularly those forms of illness which require care by specialists or in hospitals. It may be mentioned also that, in New York City, the Academy of Medicine estimated that 80 per cent of the patients cared for in the clinics received service in a specialty.

In other words, what this panacea proposes is that that great mass of the population who are normally self-supporting and self-respecting, but whose incomes are only slightly above the minimum level of self-support, are to have no other recourse in sickness than the personal charity of a professional man. We must frankly face the fact that such an alternative will never be acceptable to the American people. The fact that professional charity may be generously and even gladly given is beside the point. The medical service of a people cannot rest upon a pavement of good intentions.

Dr. Johnson's panacea fails also to take into account the unevenness and uncertainty of the sickness burden. The trouble with the national sickness bill is

not so much its total amount as its uneven distribution. If it could be equalized by group action, as by insurance, millions of people could secure care and professional men have remuneration because the consumer could save systematically in advance against his sickness.

This favorite panacea is also unworkable for a deeper reason. The producer of any service or commodity cannot expect to "run the show." The consumer has a part in the game. It takes two to make a bargain. Millions of applicants for medical service will have something to say about the manner in which they are to be served, the amount they are to pay and the modes of payment.

Suppose that studies of the cost of living show high relative expenditures for what are called "luxuries" as compared with those for medical and dental care. It is probably true that the people of the United States spend a third more for candy than for physicians, six times as much for jewelry as for organized prevention of disease and more than three times as much for tobacco as for dentistry. Disinterested philosophic guidance of family spending habits would undoubtedly revise these percentages, but the expenditures of 100,000,000 people are not at present controlled by philosophic tenets. Nor does criticism of the way that other people spend their money take any critic very far. Merely to criticize the public for what producers of medical services think to be unwise or unnecessary outlays will do more harm than good. Merchants long ago learned that their sales were not increased by scolding their customers or by criticizing their competitors. Merchants have learned to study present and potential customers, and the motives which initiate and guide their expenditures, and then to devise ways of developing these motives.

Suppose the producers of medical service start to study their customers. They will find among other things that, by and large, families spend money for medical and dental care in proportion to their resources. Thus, in the most recent and extensive study by the Committee on the Costs of Medical Care, families with incomes from $5,000 to $10,000 a year expended more than four times as much as those with incomes of less than $2,000. The physiologic needs of an equal number of persons from the two groups of families are doubtless about the same. This higher expenditure was due partly to higher fees, but, in greater part, to the larger amount of service purchased. There is reason to believe that the average wage earner's family does not spend more than $12 a year for dentistry. This means that a great many spend nothing at all in some years, and that few spend any considerable amount except for the relief of pain or when there is advanced decay or disease. On the other hand, ninety-six families of the faculty of the University of California with regular but very moderate incomes, mostly of the $3,000 to $4,000 level, spent an average of $50 a family for dental service, and practically all the families spent a sum approaching this amount.

There is reason to believe that people will expend considerable and increasing sums for the care of health provided two conditions exist: (1) they must be convinced that they will get results; (2) they must have the money to spend. This expansion in demand even for rather expensive service is well illustrated by the manner in which, within a single generation, the city-dwelling public of the United States has been "sold" to surgery

and to the use of the hospital for maternity care. The demand for dental service has been greatly extended and diversified, during the past fifteen years, among the better-educated section of the population. Educating the consumer will pay; criticizing him will not.

Whatever the prerogatives of the medical and dental professions with respect to the furnishing of professional service, the power to control the economic and legal conditions under which service shall be rendered and paid for rests primarily in the public. The large area of joint problems is sometimes not recognized.

Henry L. Banzhaf, in a recent address, says:

> Since the state and industry are interested in healthy citizens and efficient workers, an increasing effort will undoubtedly be made through compulsory health insurance, part pay clinics, industrial clinics or departments of public health to provide dentistry for all persons. Thus, the dental profession in America may be confronted with the same economic problems as those that are being encountered at present by our colleagues in certain European countries. These problems must be met in the future and should be solved under the auspices of the dental profession, not under the direction of lay groups who would be interested mainly in purchasing dental services as cheaply as possible.

I beg to point out that these matters cannot be solved "under the auspices of the dental profession." The power to solve them does not rest there. They can and should be solved with leadership and cooperation from the dental profession, working with the public in an endeavor to maintain high standards of service and a worthy and advancing status for the dental profession itself.

M. L. Harris, recently president of the American Medical Association, has, in numerous public addresses, proposed that medical service be furnished through a systematic organization of the physicians in each community. He declares that each county medical society should organize its members as a clinic which shall supply medical care and which shall be under the complete control of the physicians.

I do not know that any county medical society has thus far accepted this proposal. I do not believe that many will do so in this particular way, though I do look forward to seeing a large expansion of clinics formed by selected groups within the profession.

It will be well to devote attention to the large and growing number of examples of cooperation between the public and the medical profession in furnishing organized medical service. The outstanding illustrations of this are afforded by the hospitals and clinics throughout the country. You are all familiar with the immense growth of these institutions. Sixty years ago, there was about one hospital bed to every 1,500 of the population. Today, there is about one bed to every 140 persons. The capital invested in the land, buildings and equipment of hospitals is more than $3,000,000,000. In 1900, there were about 100 clinics in the United States, and in 1926, there were nearly 6,000. The American Medical Association estimated in 1922 that about 30,000,000 visits were paid in a year to the clinics in the United States by about 9,000,000 or 10,000,000 persons. The number of clinics and of persons served has substantially increased since then.

What is a hospital from the standpoint of organization? A typical hospital in this country is not set up for business purposes. Only about 9 per cent of the $3,000,000,000 above referred to has been expended with an expectation of financial return on the invested capital. The typical hospital is an organization established

not for profit but for public service. It may be set up under governmental control. In this case, the capital invested comes from taxes or public bond sales; the management is in the hands of government officials or, frequently, of a board of trustees composed of public-spirited citizens appointed by some official authority. The typical hospital which furnishes care in ordinary acute medical and surgical conditions is not under the control of the government but of a board of trustees or a church. The board of trustees is composed of lay men and women who carry the financial and legal responsibility for the hospital, and who appoint a group of physicians and, to an increasing extent, dentists also as the members of the hospital staff. These men constitute the professional body or faculty of the hospital. They have no financial responsibility for its maintenance, but in their hands is vested the control of the standards and quality of the professional work of the institution. The relation is similar to that of the trustees of a university and its faculty. The faculty has the responsibility for the subject matter and methods of instruction.

It is true of both the university and the hospital that many questions of policy are joint questions. They cannot be settled wisely by the financial or business side alone, nor by the professional side alone. In all well-organized hospitals, such problems are matters of joint conference between the medical staff and the lay trustees or between working subcommittees representing both groups. No finer example exists anywhere of constructive and successful cooperation between lay and professional groups than in the management and the determination of policies of hospitals all over this country.

It is well to recognize also that this cooperation in our hospitals is based on a fundamental analysis of the respective functions of the public and of the profession. These producers and consumers of medical services both have their jobs. These jobs are complementary. The actual performance of the technical work is wholly professional. The payment and the financing thereof is essentially the public's responsibility. The determination of most of the essential policies is generally a joint task. This analysis of functions is actually recognized in the working organization of every well-organized hospital and, what is even more important, it actually works.

Let us take another example of cooperation between public and profession of an equally far-reaching, though different, nature; namely, in the public health agencies of the United States. In the official health department of the state and local governments, the public sets up an official health agency as a department or bureau which, while under the direction, and with the financial support, of government officials, necessarily depends on professional men for the performance of its work and on the professional organizations of medicine and dentistry for making its work wide-spread and effective. Without the cooperation of the medical and dental professions, public health service would have lagged far more than it has, although there have been difficulties enough, and, in some cases, opposition from short-sighted professional persons or societies.

Likewise, in this country, a network of nongovernmental voluntary health agencies have been established. One needs merely to mention the national and local tuberculosis organizations. On their committees, which exist in about 1,200 localities throughout this country,

will be found physicians and lay men and women working together for a common purpose, the control of this disease and the general promotion of health. Here again, there is a division of functions corresponding to the natural and appropriate responsibilities of profession and public. The finances are carried by the lay group, while professional direction and guidance is in the hands of the professional members. The two groups function jointly on governing committees.

To an increasing extent, dentists are being drawn into such health agencies, as the scope of dentistry is recognized as extending beyond the teeth, and as including broad problems of health. Admirable instances of this are seen in the mouth hygiene councils or societies. Chicago is to be congratulated on the recent organization of just such a body. Its board of directors, formed of delegates from both lay and professional bodies, exemplifies the principle of partnership which I am discussing. Its program includes public education and the enlargement of practical dental service to children, and requires for its effectiveness the continuous cooperation of the lay and the professional groups.

Let me take one more illustration from the dental field. It has been estimated that not more than 20 per cent of the population secure systematic and reasonably adequate dental service. Why is this? In some localities, it is due to the mere shortage of dentists, but in many communities, there are dentists whose time is not fully occupied.

Undoubtedly, the reasons are numerous, but they can be grouped into two categories: First, there is an insufficient demand on the part of the public or of a large section of the public. This lack of demand is based on lack of understanding of the value of systematic dental service, the conception of dentistry on the part of these people being that it exists merely for the relief of pain or for the replacement of teeth after extreme decay.

The second main reason is economic: dentistry is expensive on the basis of the income of 75 per cent of the population. It is true that a keener appreciation of the value of dentistry would cause a larger amount of money to be spent even by families who have only $1,500 or $2,000 a year with which to care for five or six people. Nevertheless, the price of a commodity or service has an enormous bearing on the amount of it which will be purchased. Nothing is more important, either for the public well-being or for the advantage of the dental profession, than that the dental market shall be enlarged to include a greater proportion of the public than the present 20 per cent. The enlargement of the dental market requires three things: (1) that the dental profession shall perform its primary task of furnishing a high grade of professional service; (2) that the public shall be educated to understand the value of this, and (3) that the price of the service shall be brought within the means of a larger section of the population.

In an endeavor to educate the public, the cooperation of the public with the dental profession is obviously essential. In the reduction of price, the cooperation of the profession with the public is essential, else we may have action forced by the public, furnishing low-price dentistry which would not be worth the price to be paid for it.

There is no better example of cooperation with the aim of enlarging the dental market and of furnishing dental service to people who do not now receive adequate dental care than the program

just adopted by the Chicago Dental Society for official cooperation with a board of lay trustees, to be formed, to administer a dental pay clinic for persons of small means. This is to provide a high grade of service by dentists nominated through the society; it is to charge fees sufficient to make the clinic self-supporting and provide adequate remuneration for the dentists; yet these fees, it is believed, will be within the reach of large numbers of people who at present secure little, if any, dental care.

In a noteworthy report by the Council of the British Medical Association, issued last year and outlining an extension of the health insurance system to constitute a general medical service for the British nation, this significant statement was made:

> Such a scheme may be compared to a plan submitted by an architect to a householder who wants to extend the house in which he lives, and to introduce all modern improvements. The householder may, on seeing the plan, decide that it would cost too much and that he must put up with his house as it is; or he may make suggestions for the modification of the plan. But the householder knows that if he wants to extend his house, he is, as regards essentials, in the hands of the architects and builders.

Architects are professional men who know how to build houses. But the public which employs them decides when and where houses shall be built and how much shall be expended. Likewise, engineers are professional men who know how to build bridges. The lay governing body of a city or a county will do well if it does not try to dictate to its engineers the length of the girders of a bridge or the size of the piers which are to support it. The work of the engineer can begin only after the tax-appropriating body representing the public has decided that a bridge shall be built and that it shall be within certain limits of expense. Then the engineers may start to work out their specifications and estimates, and these having been approved, their actual construction can begin.

Prof. William B. Munro, in an article published by the *Atlantic Monthly* since this paper was first delivered, says these significant words of a third great profession:

> Our immediate goal, therefore, should be to bring the law abreast of the newer developments in business, in government, and in social organization. In place of the old formulas we should seek to find concepts that will stand the test of actual operations, and on these we should begin to rebuild with an eye on the realities of everyday life. Lawyers and judges cannot do this alone; they must have lay cooperation.

With respect to medical and dental services, the professions concerned are in a position similar to that of the architects, the engineers or the lawyers. Partnership between the professions and the public is essential to the realization of either the service which the public needs or the standards and dignity which are the worthy attributes of a profession.

INDICATIONS FOR ORTHODONTIC TREATMENT IN PERIODONTAL CASES*

By ALBERT H. KETCHAM, D.D.S., F.A.C.D., Denver, Colo.

THERE are indications for orthodontic treatment in each periodontal case in which there is malocclusion of the teeth; also, there are contraindications, and all these must be considered.

In further consideration of the subject, at least two questions present themselves: (1) "Why do we have malocclusion?" and (2) "Why do we have cases of periodontoclasia?" I believe the answer to both questions is that, in periodontia and in orthodontia, we are usually treating local manifestations of systemic unbalance. Marshall, Howe, McCollum, Grieves, Mellanby and other research workers have demonstrated that through leaving some of the essential vitamins out of the diet of experimental animals, malocclusion of the teeth and conditions similar to that of pyorrhea in the human mouth may be produced. Martha R. Jones has emphasized the importance of the effect of the degree of acidity and alkalinity of the diet. F. V. Simonton, in a series of articles treating of periodontoclasia,[1] states: "This means, freely translated, a breaking down of the tissues which surround the tooth." I shall also quote from one of Dr. Simonton's interesting observations:

It occurred to us that if normal adult dogs were placed on a diet similar to that used for inducing rickets in young puppies, they might develop pyorrhea and remain otherwise normal. The assumption was that dental bone was more sensitive and more easily affected by deficient diet than skeletal bone generally.

This experiment was performed and reported before the Society for Experimental Biology and Medicine in 1926. It was shown that atrophy of the alveolar bone about the teeth could be induced experimentally by a certain diet in normal adult dogs without any obvious degeneration of the long bones.

John A. Marshall has said[2]:

Many men believe that G. V. Black settled the dispute when he stated that pyorrhea is a local disease rather than a local manifestation of a systemic disorder. It now appears that there is a possibility of a development of the latter point of view; for if the laboratory worker can produce the symptoms of pyorrhea by imposing a restricted feeding schedule, he will prove that the disease is a local manifestation of malnutrition and faulty diet. The ultimate correction of this condition will come from two things: (1) a local prophylactic treatment or deep scaling, the correction of occlusal trauma, and the elimination of infectious processes; and (2) a carefully devised systemic treatment which will be based on a knowledge of foods and metabolism.

So it behooves us to study the mouth as a part of the human body and not as a separate entity.

One of the indications for orthodontic treatment of periodontal cases is crowding and overlapping of the teeth, making the proper prophylactic care of the teeth im-

*Read before the American Academy of Periodontology, Colorado Springs, July 17, 1930.

1. Simonton, F. V.: Better Health, March, April, May, August and October, 1929.

2. Marshall, J. A.: Diet in Relation to Disease of Supporting Tissues, J. A. D. A., 14:2207 (Dec.) 1927.

possible. In such cases, the dental arches may be expanded, and the teeth moved into normal positions or relations so that they may function normally without undue stress being thrown on individual teeth. Furthermore, the use of normally occluding teeth in the mastication of food has the tendency to stimulate the deeper structures to renewed health. In their normal positions and function, the teeth may be cleaned in an efficient manner, and the gums stimulated by the excursions of food and of the toothbrush.

is a predisposing cause of periodontal diseases. If the orthodontist places the teeth in normal relations so that opposing cusps may function with only slight trauma, some months should be allowed to elapse before the periodontist attempts to establish more nearly perfect relations by grinding the cusps.

We are all familiar with those cases of dysfunction caused by the protrusion of the upper anterior teeth or the posterior position of the mandible, or both. This dysfunction is apt to result in loss of the

Fig. 1.—Models from a man, aged 34; before orthodontic treatment, February, 1903. Pyorrhea, protrusion of the maxillary central incisors and narrowing of the dental arches are present. Orthodontic treatment followed that for pyorrhea, with the result shown in models made August, 1903. The condition of teeth and gums and positions of the teeth remained good until the patient's death, ten years later. During this time, the case received prophylactic care at regular intervals.

In cases of malocclusion of the teeth, the inclined planes do not glide smoothly over one another; therefore, a condition of trauma is induced in which an abnormal strain is thrown on some of the teeth. This produces an undue and unnatural stress on the periodontium, and lingual periodontium of the maxilla and deep pocket formation. The treatment of this condition is illustrated by the following case (Fig. 1):

A man, aged 34, came in for pyorrhea treatment. The upper first and second molars and second bicuspids had been extracted or lost, presumably through pyorrhea, and the

lower cuspids had been extracted, probably on account of an irregularity. The upper central incisors were protruding and had deep pyorrhea pockets on the lingual surfaces of roots, and there were pockets of lesser degree around the roots of some of the other teeth. Serumal deposits were removed from the roots of the teeth and roughened surfaces smoothed, and stimulation was applied to the gum tissues through prophylaxis, etc. In February, 1903, orthodontic appliances were placed on the upper teeth, and, in a few months, expansion was secured in the region of the first bicuspids and cuspids, and the incisors were moved into alinement so that they occluded with the lower teeth. The condition of the gums and of the alveolar process became good and remained good for a period of ten years, at which time the patient died from a recurrence of tuberculosis.

You all no doubt understand the theory of orthodontic tooth movement. Oppenheim[3] has shown that through gentle stimulus applied to the teeth by the means of orthodontic appliances, the bone-forming cells are stimulated to increased activ-

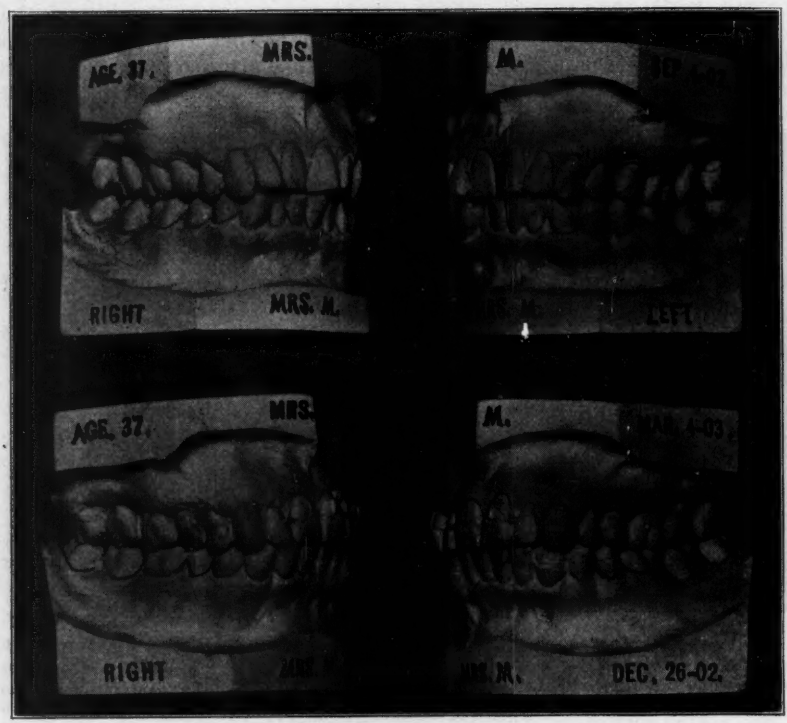


Fig. 2.—Suppurative type of pyorrhea with dental arches constricted and teeth irregular, in a woman, aged 37. Models made in September, 1902, show the extent of malocclusion, also indications of loss of the alveolar process between some of the teeth. Models made in March, 1903, show the result of orthodontic treatment. Through faithful prophylactic care by both patient and periodontist, the teeth and gums have remained in good condition.

3. Oppenheim, Albin: Am. Orthodontist, 3 (Oct.) 1911; 3 (Jan.) 1912.

ity and a deposition of new bone takes place. If, therefore, orthodontic appliances are used which exert a uniformly light pressure in this manner, through moving the teeth the periodontoclasia is often greatly improved because of the deposit of new bone.

The orthodontist may help the periodontist by placing the teeth in better occlusal relation, and this form of treatment may be successfully employed even into middle life. While bone growth, the continuous process of tearing down old bone and the building of new, is more active in youth, it may be accelerated later in life, as the following case shows:

A woman, aged 37, had the suppurative type of pyorrhea. (Fig. 2.) There were deposits on the roots of her teeth, with pus pockets. Some of the upper teeth were pulpless, and today, with our advanced knowledge, would be condemned. The case responded well to scaling and gum stimulation. At that time, I was limiting my practice to the treatment of pyorrhea and to orthodontia; and, as two sons of this woman were among my orthodontia patients, quite naturally the question of correcting the irregularity of her teeth was discussed, and orthodontic treatment was decided on. Appliances were placed

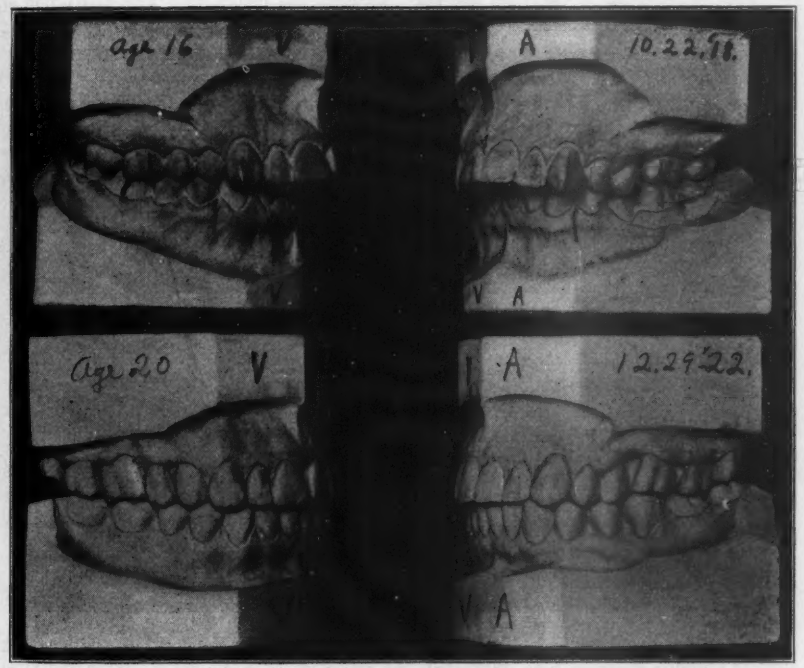


Fig. 3.—Noninflammatory type of case with extensive absorption of the alveolar process between the maxillary buccal teeth, in a girl, aged 16. Models made in October, 1918, show marked malocclusion of the teeth. Those made in December, 1922, show the result obtained through orthodontic treatment.

on her teeth in September, 1902. Active tooth movement was completed in March, 1903. Then, for several years, close watch was kept for recurrence of serumal deposits and resulting inflammation of the gums. The patient was very faithful in the care of her teeth and reported regularly for treatment. Since 1908, when Arthur C. Hamm assumed the treatment of pyorrhea cases in my practice, her visits have continued at intervals of three months (for twenty-two years). During the last half of this period, the pulpless teeth have been removed one by one, until now she has come to the consideration of a full upper denture. The lower teeth and supporting tissues are in a healthy condition.

We must consider the noninflammatory type of periodontal cases in which the alveolar process is being absorbed, sometimes in persons apparently otherwise in good health. Unless the physician is able to discover the constitutional cause and is able to prescribe corrective measures, it is usually unwise to institute orthodontic treatment. A case in point follows (Fig. 3):

A girl, aged 16, had a posteroclusion of the lower teeth with a narrow maxillary arch and protrusion of the anterior teeth. The roentgenograms revealed extensive absorption of the alveolar process around the upper bicuspid and molar teeth, also destruction to a lesser degree around the corresponding lower teeth. The girl had been under treatment by a competent periodontist. The gums were firm and presented a healthy color. The history of the case showed that there had been no deposits on the roots, and no pus present. Orthodontic treatment was undertaken with the idea of developing the jaws to normal

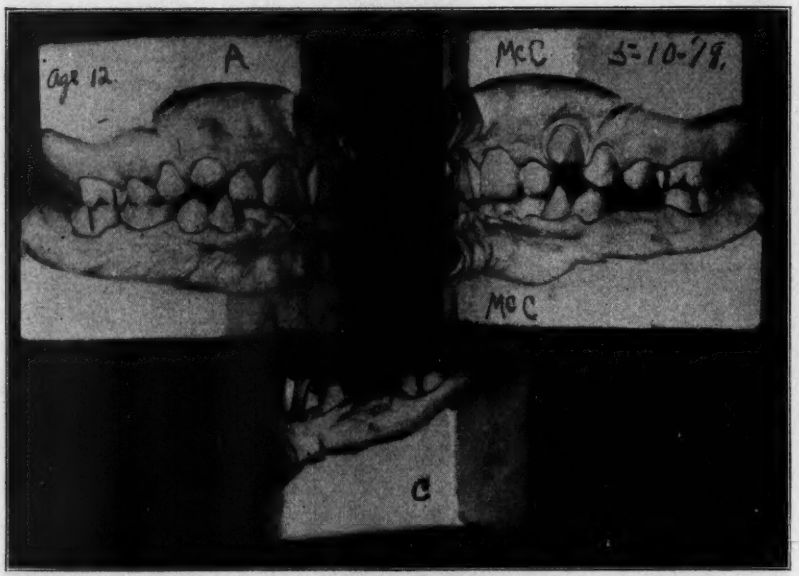


Fig. 4.—Hypertrophied gum tissues, with serumal deposits and rough enamel in a girl, aged 12. Models made in June, 1919, show the extent of the malocclusion. Those made at later dates show the improvement following treatment, first, from the periodontist, and then from the orthodontist. (Compare Figure 5.)

shape and placing the lower teeth in correct relation to the upper teeth, thus reducing trauma and also improving the facial lines. The parents were advised that even if the teeth having the greatest loss of supporting structure were lost in a few years, the position of the remaining teeth and the shape of the jaws would make for a more favorable condition for restorations.

During orthodontic treatment, tooth movement progressed satisfactorily. Roentgenograms taken at regular intervals revealed a progressive loss of alveolar process, although the gums continued to have a healthy appearance and there was no evidence of pus. Neither could the periodontist find deposits or roughness on the roots of the teeth. The condition of the alveolar process around the anterior teeth was good.

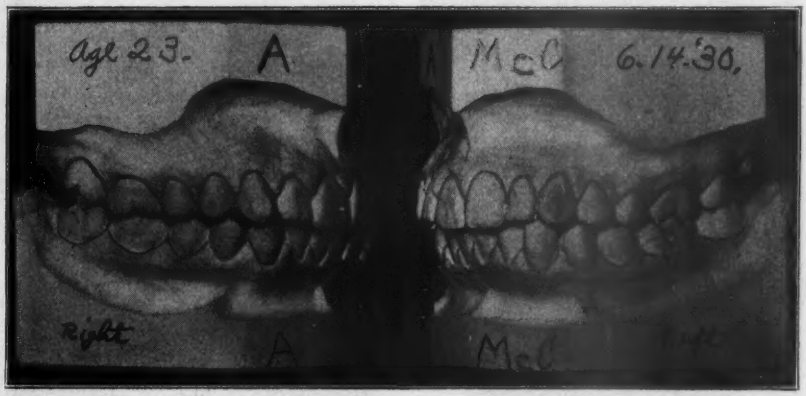


Fig. 5.—Models showing improvement in case shown in Figure 4 after periodontal and orthodontic treatment.

This was undoubtedly an unrecognized case of noninflammatory pyorrhea. Today, such a case would first be referred to a physician trained in the diagnosis of conditions of obscure nutritional imbalance.

The orthodontist's responsibility to children is greater than that of the periodontist, for the reason that orthodontists see more children and see them earlier in life than the periodontist does. Many of these children have gingivitis, the cause in some cases being calcareous deposits, in some cases rough enamel and in some cases faulty nutrition. The first two types of cases should be promptly referred to the periodontist, lest irreparable damage to the alveolar process result. In the other cases, there is a condition of profuse bleeding of the gums at the necks of the teeth. These are cases in which both the periodontist and the physician should cooperate before orthodontic intervention. It may be that in cases of profuse bleeding of the gums following the age of puberty, the systemic imbalance sometimes associated with this period is the major factor. Simonton states[1]: "Now certain phases of dentistry are wholly dental. Most of the restorative work, as in fillings, crowns and bridges, is a pure specialty. But pyorrhea therapy, orthodontia and preventive dentistry involve general biologic factors which render them composite. They frequently present joint dento-medical problems."

I firmly believe that, in these cases, the periodontist and the orthodontist need the help of the keen-minded medical diagnostician.

The following case (Figs. 4-5) emphasizes the importance of cooperation between the periodontist and the orthodontist:

A girl, aged 12, had hypertrophied gum tissues and an enlarged tongue, held in the floor of the mouth, and which had apparently caused an overdevelopment in width of the mandible in the region of the first permanent molars. There was also some constriction of the maxillary arch in the first permanent molar region. As a result, the maxillary molars locked lingually to normal. The hypertrophied gum tissue is shown by the models made before treatment of the condition by Dr. Hamm, who removed deposits,

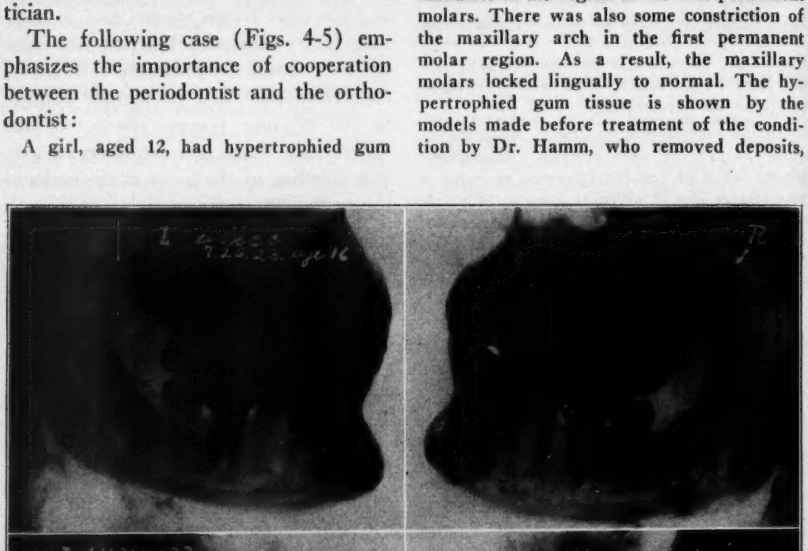


Fig. 6.—Extra-oral roentgenograms. The upper right and left set made at age 16 show that the mandibular third molars are assuming positions of impaction, while the right maxillary third molar is forming in a position in the jaw posteriorly to normal. The two lower roentgenograms made at age 23 show that the impaction of the mandibular third molars has increased, also that the maxillary third molar on the right side has moved forward and outward until the crown of this tooth has apparently caused a forward displacement of the root end of the second molar, thus tipping the coronal portion of the second molar backward. The mandibular third molar on this side of the mouth has likewise apparently caused a forward displacement of the root end of the second molar, also tipping the coronal portion backward, with the result that the normal relations of the occlusal surfaces of the second molars have been upset.

smoothed the rough enamel and instituted correct prophylactic care. Orthodontic appliances were applied in June, 1919, and the teeth guided into occlusion. The enlarged tongue exerted pressure between the occlusal surfaces of the upper and lower posterior teeth, especially on the right side, thus opening the bite to a slight extent. Active treatment was required for about two years to overcome this condition, but it was finally corrected, as is shown by the models made recently. It is now nearly eight years since all appliances were removed. The condition of the gums is very good.

This case also illustrates the danger to the second molars primarily, and to the balance of the teeth secondarily, from the third molars assuming positions of impaction while forming, often producing pockets distally to the second molar, and frequently tipping the crown of the second molar out of occlusion. At the age of 16 years, the extra-oral roentgenograms (Fig. 6, above) showed the mandibular third molars assuming positions of impaction, while the maxillary third molars were not exerting influence on the second molars. Attention is called to the posterior relation of the maxillary right third molar. It will be noted that, at this time, the second molars are in relatively normal positions. At the age of 23 years, the roentgenograms reveal (Fig. 6, below) that both the upper and lower third molars on the right side have pushed the roots of the second molars mesially, thus tipping the crowns out of normal relation. Thus, these impaction cases are related directly to orthodontia by disturbing the occlusal relations, and to periodontia by producing trauma and pocket formation. This condition should be recognized, and the third molars removed much earlier in life.

CONCLUSION

The orthodontist may help the periodontist in the treatment of many periodontal cases. He must be very careful indeed to fit bands, especially molar bands, so well that they will not cause irritation. The fit of molar bands in these cases should be checked with the roentgenogram. The orthodontist must strive to place the tooth cusps in normal relation, so that normal function may be secured and trauma obviated. A more frequent reference of patients between periodontist, orthodontist and medical diagnostician will result in greater benefit to the patient.

DISCUSSION

W. Claude Adams, Portland, Ore.: I wish to ask the essayists whether they make a practice of balancing the occlusion during the time of the movement of the teeth. Dr. Hoffman spoke of waiting until the teeth are settled. I should like to ask whether he did any correcting of the occlusion before.

Grace Rogers Spalding, Birmingham, Mich.: I should like to ask Dr. Ketcham about the case of the woman who was 37 years of age at the time treatment was begun, a combination of orthodontic treatment and treatment by the periodontist. After a period of twenty-eight years, I understood you to say that she had dentures made. Is that correct?

Dr. Ketcham: Dr. Hamm can answer that question better than I can as she is under his care. Today, we would condemn some of the molars and bicuspids that I left in her mouth.

Arthur C. Hamm, Denver, Colo.: This was especially interesting on account of the age of the patient, 37, when Dr. Ketcham instituted orthodontic treatment in a pyorrhea case, correcting the malocclusion. I attribute the retention of the teeth in this case to three facts: The patient seemed to have more than the average immunity (which I think is vital), she had especially good habits and she had the will to cooperate with the operator: essentials for success. Today, we might perform a surgical gum resection in such cases. I don't wish to disagree with Dr. Spalding, but I believe that had we resected the gum at that time, the mouth today would be in better condition, although the patient tried hard to cooperate. She used the best

methods that we had at our disposal or that she thought were best and was very diligent. She still comes in every three months, not to have her teeth cleaned, but for a checking up of the roots, and to lessen the number of dangerous oral micro-organisms. I feel that had Dr. Ketcham had the case ten years sooner, probably the patient wouldn't even be thinking of having an upper denture made. Some of her teeth were affected with caries earlier. The teeth became pulpless and that is one of the reasons that she is losing them. She had partial dentures inserted, and when the molars on the upper right side became too loose to retain the partial denture, all that was left were the anterior teeth, she having lost the upper teeth on the left side. We have had to resort to a full denture in order to have proper mastication.

E. Melville Quinby, Boston, Mass.: With reference to the case mentioned between Dr. Ketcham and Dr. Hamm, I didn't hear any specific report of the roentgenographic survey. I wonder if they have established any definite rule as to the amount of absorption that would prohibit orthodontic procedure, say, anything over 50 per cent or half of the absorption of the alveolar process. If a patient, for instance, had three-quarters absorption, would orthodontic procedure be justified, would they wait until they found out whether they could get through periodontal treatment a certain amount of regeneration, or would they hope from the orthodontia to get regeneration? That is a point that is brought up frequently in the treatment of such cases. I am extremely interested to hear this description of orthodontia as being applied at the age of 37. I have often felt that one might be justified in carrying out such procedures; in other words, the restoration of function through every measure that can be suggested, both biologic and through the arrangement of dental units; also an efficient system of mouth hygiene; all necessary prosthetic work to get a physiologic occlusion.

Rudolf Kronfeld, Chicago, Ill.: I should like to get some information concerning the roentgenograms that have been shown. At different times, in taking roentgenograms, I have found very great differences in the bone, sometimes so amazing that we thought there must be some other reason for these things. We split two skulls and took roentgenograms that were later developed. We could show all stages of periodontoclasia, sometimes with the entire bone missing between the teeth. In another case, merely by a few changes in methods, the same skull and the same kind of film exposed for the same time afforded an entirely different picture of the bone. So we have thought it best to discard the roentgenogram entirely in indicating periodontal conditions, because if a roentgenogram is taken three years later, we may be dealing with another type of film, harder or softer, or we might use another developer, and consequently get entirely different results. It would be much better to depend on the clinical examination to determine whether the tooth is loose or not, or to ask the patient whether the abscess in the pocket has apparently made any progress. It is easier to check up in this way than to depend so much on technical methods or technical changes.

Harold H. Leonard, New York City: I should like to ask Dr. Ketcham whether orthodontists consider it advisable to grind teeth. In speaking of cooperation with the periodontist, he spoke as though it was in the particular field of the periodontist to grind the teeth for regulating the occlusion. Do orthodontists never consider it as in their field or a part of orthodontic procedure?

A member: I should like to ask the essayists if they have any data on treating cases of retrusion of the mandible when the molars, either on one side or both, are in lingual occlusion. I have several cases of that type, patients ranging from 17 to 30 years. I should like to know whether it would be successful.

Justin D. Towner, Memphis, Tenn.: The suggestion which I have to make is the deliberate moving of teeth out of what would be in the specific case considered normal occlusion in order to eliminate crevices in the alveolar process. If you have a movement distally to a tooth, move the tooth deliberately out of line of occlusion immediately, in order to stimulate the filling in of bone in the distal portion, and, at the proper time, release the tooth and let it drift slowly back into position, which it will do. Thus, we retain bone formation and bone rebuilding. By that method, we have been able to eliminate some pockets which otherwise would have been difficult to control.

Dr. Hoffman: Dr. Adams asked about the advisability of making correction by grinding during the progress of orthodontic treatment. Every denture is in a state of move-

ment during life, but, during orthodontic treatment, it is supposed to be moved at a much more rapid rate, and changes occur which otherwise would not take place. A denture under orthodontic treatment, and for a considerable period after termination of orthodontic treatment, is in a more or less unstable condition. Consequently, it is in a state of readjustment, and, except in special instances when we know that the teeth are not going to readjust themselves to a new occlusion, I do not think that grinding is advisable. Grinding is not advisable to any extent until we are sure that the immediate changes resulting from orthodontic treatment are complete. Every rule has its exceptions and there are certain exceptions to this. For instance, you might have a case that would be too extensive to expect readjustment without grinding. Every rule is subject to its own interpretation in each instance. Does the orthodontist ever grind teeth? I don't know whether he should. I suppose we all grind teeth some, but for a definite correction of traumatism. I do not attempt to do it. I think the man who is making a special study of correcting complicated traumatisms is the one to do it. The average orthodontist is not quite so well qualified as the periodontist for this work, and, in addition, most of these corrections are due to be brought about a number of years after orthodontic treatment is completed. Consequently, this work should go to the periodontist. As to the correction of lingual malocclusion of molars in adult life, there is no reason why this should not be corrected, usually to the benefit of the patient. Circumstances alter cases. We have a pathologic condition in a lingual malocclusion of the molars, and it is just a question of whether placing these teeth in normal occlusion will give relief to the patient. In moving teeth in adult life, we always reduce more or less of the interproximal tissue. In regard to eliminating pockets by moving the teeth, I have had no experience with that. In general, moving teeth in an adult brings about a loss of a certain amount of interproximal tissue. That should be taken into consideration. I don't see how one can expect to close a pocket by moving the tooth and having it return. If you can, it is a valuable thing to prove.

Dr. Ketcham: The question was asked as to whether orthodontists try to balance occlusion. Some orthodontists, notably Stoddard and McCollum, are trying to work out a technic. At the present empiric stage, taking measurements and establishing occlusion is rather difficult. The question was asked as to what the roentgenogram showed in the woman 37 years of age at the beginning of treatment. That was in 1902. Roentgenography was in a rather embryonic stage at that time. I did not start making roentgenograms until 1905, and then the practice was not so systematic as it is today. The pockets were deep, as I remember, around the maxillary molars and second bicuspids, perhaps halfway up the root. The periodontist should clear up the condition in the suppurative type of pyorrhea by removing deposits, smoothing the roots and necks of the teeth and instituting prophylactic care. The orthodontist should wait until such time as there is no pus present, and the gums have assumed a healthy appearance. Dr. Kronfeld spoke of the difficulty he had encountered in the roentgen-ray technic in attempting to show the fine detail of the structure of the alveolar process between the roots of the teeth. It is true that we can "burn out" the fine detail of the alveolar process through an overexposure of the film and produce the appearance of pyorrhea pockets where none exist. It is possible through correct exposure and correct development of the film to secure the fine detail of the structure of the alveolar process in the resultant picture. This, with the acquisition of knowledge in the interpretation of the films, will prove of great value in diagnosis as a permanent record of the extent of the absorption of the interproximal alveolar process, or of the cellular changes in the alveolar process in root bifurcations which indicate the beginning of absorption of the alveolar process. We can obtain the narrow double coated radiatized film from the Eastman Co. I have found that they make for accuracy in roentgenographing the anterior portions of the narrow mouths which are so common in pyorrhea and orthodontic cases, for the reason that there is less bending of the film and therefore less distortion in the resultant picture. A poor roentgenogram coupled with lack of knowledge in interpretation is worse than no roentgenogram at all, as the result may be disastrous to the patient. Fortunately, the knowledge of correct roentgenographic technic and interpretation is not too difficult for the earnest, intelligent operator to acquire. Alveolar

crest absorption sometimes occurs in young people. Dr. Banks, an associate of Dr. Humphrey's and mine, has spent his spare time the last two years analyzing the full mouth roentgenograms of our young patients. At the present time, he has reported on his analysis of the roentgenograms of 402 of our patients, and finds that in these alveolar crest absorption occurred in 7 per cent of the cases.

RESULTS OF THE SURVEY CONDUCTED BY THE GUILD RESEARCH BUREAU FOR RITTER DENTAL MANUFACTURING COMPANY, INC.

IN June of this year, the Guild Research Bureau, of New York City, at the request of the Ritter Dental Manufacturing Company, Inc., of Rochester, N. Y., conducted a survey designed to reveal the views of the dental profession on two very important questions: (a) panel dentistry, and (b) children's dentistry.

There were several important reasons why Ritter desired the information which such a survey was designed to reveal.

Naturally, the Ritter organization is keenly interested in the welfare of the profession because it realizes that only as dentistry prospers can Ritter prosper. The two subjects affected by the survey are the most significant and important before the profession today, and Ritter felt that it wanted to formulate its program along lines indicated by the profession it serves, rather than along those laid down by some outside agency.

As the questionnaire used in conducting the survey stated, the two subjects of panel dentistry and children's dentistry are of unusual interest and importance, and are now engaging the attention of dentists everywhere. The questionnaire asked sixteen questions, designed to bring out facts, figures and opinions which would indicate the attitude of the profession on these subjects. Thanks to the courtesy of those dentists who replied, it did so to a remarkable degree. Both the Ritter Dental Manufacturing Company, Inc., and the Guild Bureau wish to take this opportunity to thank them for their interest.

Questionnaires were mailed to about 5,000 dentists, living in practically every state in the Union and every province in Canada. These dentists were carefully selected, so that a representative cross-section of the profession as a whole might advance its views. Nearly 2,000, or 40 per cent of the 5,000, replied, 1,649 of these returning completely filled-in questionnaires, from which the figures following were compiled. The Guild Research Bureau, which has conducted many similar surveys, states that this is most remarkable, being almost twice the normal return. This high percentage of returns is indicative of the widespread interest in the subjects covered.

Vying in interest with the statistics disclosed by the survey were the opinions expressed, both on the questionnaire as a whole and on the individual questions. As is usual in surveys of this type, the name of the sponsor was not revealed, this being done to insure perfectly independent answers. Dentists who wrote requesting to know who the sponsor was were informed, and a large percentage

of these responded with filled-in questionnaires. While recipients were informed that they need not sign their names unless they wished to do so, a large majority did so.

The questionnaire as a whole was most freely commented on, expressions ranging from that of a Nebraska dentist, who said, "Congratulations on your marvelous foresight!" to that of a Michigan dentist who said, "This resembles one of Henry Ford's 'idiotic' surveys." Practically all repliers caught the spirit in which the questions were asked, and replied seriously, and in full.

All of the questions asked were designed to be answered with a simple "Yes" or "No" or with a figure. A large percentage of answered questionnaires enlarged on some or all of the questions. Others left some questions blank, or so framed the answer that it could be tabulated as neither "Yes" nor "No." Such answers were tabulated "Did not answer." In the tabulation below, a brief discussion of each question will attempt to give the prevailing sentiment.

Question 1. Would panel dentistry tend to lower the type of man entering the profession?

1,470 said, "Yes."

120 said, "No."

59 did not answer.

A Philadelphia dentist expressed quite comprehensively the opinions of those answering "Yes." He says, "Panel dentistry is a form of government ownership. Most governmental positions are held by incompetent men. Panel dentistry would undoubtedly attract this type of man." Others pointed out that it would reduce the incentive to work for success, and to do good work.

On the other side, some dentists made the point that as long as at least a six-year course preceded a dental degree, and as long as the standards of entrance and graduation at dental schools were not lowered, the quality of dental student graduating would remain essentially the same. Some of those answering either "Yes" or "No" remarked that the scale of fees or salaries established would have some effect on the type of man entering practice. Others remarked that judging by other governmental endeavors, this was bound to be low.

Question 2. Would panel dentistry, as respects the profession as a whole (a) increase income, (b) decrease income, (c) have no effect?

137 said, "Increase."

1,189 said, "Decrease."

134 said, "No effect."

189 did not answer.

Discussion of this question seems to reveal that the dental profession (as represented by those answering this questionnaire) believes that dentists now having large or medium incomes from their practices would suffer from panel dentistry, while those who are not so successful would benefit. Since, as an Iowa dentist says, the successful dentists are in the majority, the profession as a whole would be bound to suffer. Others anticipate that, under such a system, so many people would receive the benefits of dental treatment that an increase would result.

Question 3. Would panel dentistry affect the quality of dental work (a) favorably, (b)unfavorably, (c) measurably?

83 said, "Favorably."

1,421 said, "Unfavorably" (362 also checking, "Measurably").

90 said, "Measurably," without indicating whether they thought favorably or unfavorably.

56 did not answer.

In commenting on this question, several dentists compared panel dentistry to army dentistry during the war. A Pennsylvania dentist who served in the Army states their case when he says, "Dentists who were 'good to excellent' dentists in private life fell far below that which they were capable of doing." A New York dentist remarks, "You should see some of the work turned out under the panel system in Germany and England." Many remarked that with little or no premium offered for doing exceptional work, both initiative and technic were both bound to suffer.

Question 4. Would panel dentistry, in your opinion (a) increase your income, (b) decrease your income, (c) have no effect?

72 said, "Increase."
1,037 said, "Decrease."
359 said, "Have no effect."
181 did not answer.

There was singularly little comment on this particular question. Those who believed that panel dentistry would increase their income were spoken for by a dentist from a small community in Kansas who said that if a stipulated fee also implied guaranteed payments for his services, he believed it would increase his income. Those who believe that their income would be decreased did not express themselves as particularly worried about this aspect. They were much more concerned about its affect on the quality of dental work. Those who did not answer, and who also commented, said it would depend on the scale of fees set up.

Question 5. Would panel dentistry affect the progressive dentist, who follows modern methods, (a) favorably, (b) unfavorably?

131 said, "Favorably."
1,405 said, "Unfavorably."
113 did not answer.

The prevailing view on this aspect of panel dentistry, as expressed by comments on the question, seems to be that lack of incentive to success, which many dentists believe that panel dentistry implies, will make itself felt most of all on the progressive element in the profession. "Why," as a California man expressed it, "learn new and better ways of caring for teeth when a man across the street, using the old, and probably easier and cheaper way, will receive the same fee?" This question, and questions 3 and 4, were felt to be closely allied. Some of those whose answers were tabulated under "did not answer" said that they believed panel dentistry would not affect the progressive dentist at all. As the figures show, they were in the minority.

Question 6. Do you favor panel dentistry (a) from your own point of view, (b) from the public's point of view?

To *a*, 71 said, "Yes."
1,487 said, "No."
91 did not answer.
To *b*, 210 said, "Yes."
1,183 said, "No."
256 did not answer.

One interesting aspect of the answers to this question is the fact that three times as many dentists favor panel dentistry from the public's point of view as favor it for themselves. This seems due to the belief on the part of many that at present a dangerously small percentage of people are receiving any dental attention at all, good or bad. These dentists figure that any system or movement which would cause more people to receive dental care would be worthy any attendant inconvenience or harm. Those who did not favor panel dentistry from any point of

view—the vast majority, as figures show—gave practically the same reasons for not favoring it as they gave to questions 2, 3 and 4. And even some of those expressing themselves as now in favor of it said that eventually the public would suffer because of the lowered quality of dental service such a system seemed bound to produce.

Question 7. If you do not favor panel dentistry, what immediate steps would you take to combat it?

337 said, "Organize the profession against it." These dentists suggested the establishment of lobbies in national and state capitols, discussion of the subject at all dental society meetings, strengthening of the American Dental Association and the state and local bodies by urging every ethical dentist to join and to be active, and by urging members to vote and talk against panel dentistry at every possible opportunity.

264 said, "Educate both the public and the profession." Radio and press propaganda for the public were suggested. Dentists were urged to talk to every patient about both the benefits of modern health dentistry and the dangers of commercialized dentistry. The need for education of dentists themselves along these lines was also suggested by several. One dentist suggested the establishment, in every dental school, of a department of pedodontia, along the lines of that recently started at Marquette University.

134 urged the establishment of clinics, or, similarly, the widespread adoption of group practice for those unable to afford the services of a good private practitioner. The view of these dentists is that adequate dental treatment for everyone is needed, and if the dental profession does not take immediate steps to supply it, the state will step in and do so. Better, they say, that we ourselves do it than the state. In the long run, everyone will gain.

61 brought up the point, now receiving wide discussion in the profession, that perhaps the average dental fees are too high for many people. They advocated lower fees, or at least scaling of fees to the ability of the patient to pay. Several of these also injected the question of eliminating the advertising dentist, who they believe is attracting an undue share of unfavorable attention to dentistry.

853 did not answer. Among these were the dentists who favor panel dentistry from either their own point of view or that of the public. This group also included those who confessed that they did not know what to do about it, those who said they would do anything within reason, those who said, "It is coming; nothing we can do will stop it!" and those who said, "The American people will never stand for such regulation. Why worry?" Another large group also believe that silence is the best means of stopping the progress of panel dentistry.

Question 8. Do you agree that all children are entitled to adequate dental service?

1,575 answered, "Yes."

24 said, "No."

50 did not answer.

This question excited little comment. Those who answered "Yes" apparently seemed to take the answer for granted. The few who answered "No" qualified their replies with some such phrase as "No more than they are to food or clothing." Those who did not answer generally did not comment.

Question 9. Do you favor the establishment of children's dental clinics wherever possible? If so, preferably under what auspices?

To the first part of the question, 1,491 said, "Yes."

91 said, "No."

65 did not answer.

This question also received little comment. One Illinois dentist who replied "No," expressed the opinion that the country was "over-clinicked" now, at least in many sections of country, and that clinics limited the field of the dentist who was willing to do children's work, even at very moderate fees.

The second part of the question brought forth a great divergence of opinion.

433 dentists thought that such clinics should be under professional supervision, no matter who sponsored them or, rather, who paid the bills. As a Nebraska dentist expressed it, "Certainly in the profession, and not in politics." The great majority of this group believe that such clinics should be under the auspices of organized dentistry, such as local or state societies or the A. D. A.

330 dentists believe that such clinics should be conducted by the schools, or boards of education. Their view is that, under such auspices, more children will benefit. Here too, there is a sentiment that the profession should have an important part in the clinic management.

172 said that such clinics should be established by the municipal authorities, with again a strong feeling that the profession should have a voice in their conduct.

144 advocate state or county management.

103 suggest charity management, community chests and private philanthropy both being mentioned. About one-third of this group believe that clinics of the Eastman or Forsyth type are ideal.

51 believe that such clinics should be managed by existing hospitals.

47 believe that the federal government is the proper agency to conduct such clinics.

28 believe that, when available, dental colleges were the place for such clinics, with students or recent graduates in charge.

11 think that the Red Cross should manage such clinics.

330 did not answer.

Question 10. Do you believe that patients of such clinics should be confined to those who cannot afford private dentistry?

1,415 answered, "Yes."

173 answered, "No."

61 did not answer.

Those dentists answering "Yes" seemed to feel that little or no explanation of their views were necessary. Those who answered "No," often expressed the opinion that if the clinics were supported by public funds, it would be neither right nor possible to limit the children receiving treatment. Others brought up the point that, in any case, many patients who could afford to pay for private dental care would come anyway. Others said that clinics should be open to all for diagnosis, or prophylaxis or both, if not for treatment.

Question 11. Are you a specialist in any branch of dentistry? If so, in what branch?

Of the 1,649 replying, 1,396 were general practitioners, though a few of these reported tendencies to specialization.

203 were specialists.

50 did not answer.

The 203 specialists were divided as follows:

46 orthodontists.

45 oral surgeons.

31 exodontists.

21 periodontists.

16 in prosthetic dentistry.

12 in pedodontia.

15 in restorative dentistry.

5 in pyorrhea.

5 in ceramics.

4 in preventive dentistry.

2 in roentgenology and diagnosis.

1 in industrial dentistry.

Question 12. If you are a general practitioner, approximately what percentage of your patients are (a) under 6 years of age, (b) between 6 and 16, (c) between 16 and 50, (d) over 50?

313 did not answer

1,336 reported as indicated in Table 1. In making these tabulations, it was necessary to establish arbitrary percentage groups. Thus, under *a,* the group from 1 to 4 per cent (inclusive) of children under 6 received the largest number of answers, 556. Under *b,* the largest number of answers came under the grouping 20 to 29 per cent (inclusive). Under *c,* the group from 45 to 55 per cent (inclusive) received the largest number of answers. Under *d,* it was the group from 10 to 19 per cent. Which means that, arbitrarily speaking, the most common distribution of patients by age groups was

Under 6, about 3 per cent.

6 to 16, about 27 per cent.

16 to 50, about 53 per cent.

Over 50, about 17 per cent.

It must be remembered that these figures are quite general in character, many dentists remarking that, without extensive research, such estimated were little better than guesses. These figures are offered as interesting rather than as indicative of any definite conclusion.

Question 13. If you agree with a prominent dentist who says that the general practitioner who cultivates children's business is building the surest foundation for the future, what percentage of a practice should consist of children under 16?

990 answered giving a definite percentage, with results as shown in Table 2.

605 did not answer definitely. Some of these said they agreed heartily, but could give no definite answer. Others merely left a blank.

54 did not agree. Several of these said that they might agree if they had found from their experience that treating children was profitable. Even though they realized the benefits of thus

TABLE 1.—ONE THOUSAND THREE HUNDRED AND THIRTY-SIX ANSWERS TO QUESTION 12.

(a) patients under 6						
	1%	5%	10%	15%	20%	25%
0%	to	to	to	to	to	and
	4%	9%	14%	19%	24%	more
83	556	366	227	55	33	16
(b) patients 6 to 16						
4%	5%	10%	20%	30%	40%	50%
and	to	to	to	to	to	and
under	9%	19%	19%	29%	39%	more
88	137	428	441	153	57	32
(c) patients 16 to 50						
24%	25%	35%	45%	55%	65%	75%
and	to	to	to	to	to	and
under	34%	44%	54%	64%	74%	more
8	29	150	346	255	234	314
(d) patients over 50						
	1%	10%	20%	30%	40%	
0%	to	to	to	to	and	
	9%	19%	29%	39%	more	
32	297	549	358	70	30	

building for the future, they did not think that these outweighed the loss of present revenue. This, of course, was a minority view.

Question 14. Do you believe that the general practitioner should make ethical efforts to attract children as patients? Or should they be treated, if possible, by specialists in juvenile dentistry?

To the first part of this question, 1,412 said, Yes."

81 said, "No."

156 did not answer.

To the second part of the question, 448 said, "Yes."

603 said, "No."

598 did not answer.

This question brought out many views on this subject. Practically everyone agreed that if the general practitioner wanted children in his practice, he could and should make ethical efforts to attract them. Several dentists raised the point that all dentists were not temperamentally equipped to handle children and that any dentist not so equipped should turn them over a someone else. Others raised the question of age, saying that the younger men should care for children if possible.

On the question of specialists, considerable feeling was expressed. Many dentists contended that both general practitioner and specialist should have a hand in the treatment of children. Others contended that the competent general practitioner could give the child anything that the specialist could, with the possible exception of orthodontia in certain aspects. The argument over specialization in dentistry is, of course, not new. Perhaps the figures here are indicative of the general feeling.

TABLE 2.—PERCENTAGES OF CHILDREN UNDER 16 IN A GENERAL PRACTICE AS RECOMMENDED BY 990 DENTISTS.

19% and under	20% to 29%	30% to 39%	40% to 49%	50% and more
88	324	170	119	289

Question 15. Would you, right now, like a larger percentage of children under 16 among your patients?

1,026 said, "Yes."

455 said, "No."

168 did not answer.

Practically all of those who said, "Yes," said so without comment. Occasionally, a reply suggested that the dentist did not exactly want them, but felt it his duty to have them, for their own good. Those who said "No," often remarked that they were too old, or that they could not afford to have them, making the point that parents were not willing to pay even fair prices for good dental service. Others said they would gladly treat the children of families already patients, but did not care for others.

Question 16. If so (that is, if you would like more children among your patients) do you advocate the conduct of a general children's practice? Or should orthodontia be confined to the specialist in that branch of dentistry?

To part one, 587 said, "Yes."

470 said, "No."

592 did not answer.

To part two, 1,238 said, "Yes."

221 said, "No."

190 did not answer.

The purpose of this question was to discover the feeling on the question as to whether, if a dentist were treating children, he would do all kinds of work or if he would refer orthodontia cases. The foregoing figures show the returns. The feeling that orthodontia is a necessary specialty was very prevalent, judging by various remarks to the effect that orthodontia is "the only real specialty in dentistry." It was gratifying to find that many dentists said, "Whichever is for the greatest good of the child patient."

In considering this survey as a whole, too definite conclusions cannot, of course, be drawn. But it certainly shows two things: that the dental profession, as represented by the dentists replying to this questionnaire, does *not* want panel dentistry, and that it *does* believe that everything possible should be done for children. As a New York dentist said, "Children's dentistry ever, panel dentistry never."

The Journal of the American Dental Association

212 East Superior St., Chicago, Illinois

C. N. JOHNSON, Editor

Published by the American Dental Association

All expressions of opinions and all statements of supposed facts are published on the authority of the writer over whose signature they appear, and are not to be regarded as expressing the views of the American Dental Association, unless such statements or opinions have been adopted by the Association.

Communications intended for publication in the scientific or literary pages of THE JOURNAL should be addressed to the Editor. All advertising or business matters should be sent to the Business Manager.

Subscription is included in the annual membership dues. To nonmembers living in the United States or its possessions, the price is $2.50 a year in advance; Canada, $3.00; Australia, $4.00; other countries, $3.25. All foreign subscriptions are to be paid in United States money.

Editorials

A NEW LIGHT ON PANEL DENTISTRY IN AMERICA

In the March, 1931, issue of THE JOURNAL, there appeared an editorial on "Panel Dentistry" and in June there was one on "The Care of Children's Teeth." The significance of these two topics has received an added impulse by the announcement of a survey, referred to in a news item in the September issue, and published in full in the current number.

We urgently call attention to this survey as being one of the most illuminating documents we have yet seen on the subject of panel dentistry and children's dentistry. It should require very little editorial comment to amplify this survey, but one or two considerations may be suggested. One is the very comprehensive character of the survey, which must command respect and admiration on the part of the profession for all of those responsible for its consummation; and the other is the almost overwhelming vote against panel dentistry and the nearly equal vote in favor of children's dentistry.

As surveys go, this seems to be one of the most unbiased and genuine that we have seen, and we congratulate the authors and executives who inaugurated it and brought it to a successful conclusion.

As the comment in the survey says, "In considering this survey as a whole, too definite conclusions cannot of course be drawn." This may be said with equal force of any survey, but we are very sure that there is much of real value in this one and much that will compel the profession to think. That is all we need in any intelligent body of men and women such as those in the dental profession. The trouble with most of us is that we do not think seriously enough, and this is particularly true of a topic like panel dentistry. It seems so remote to us and so impossible in a country like America, but, in these revolutionary days, we never know what foolish aberration of ideas may seize the people or the legislatures and stampede them from sanity and common sense. It will never do to take anything for granted in a situation such as this. We have had too many disastrous lessons in the past, and we must realize that eternal vigilance is the price of safety and security.

In the March editorial, we took occasion to pay our respects rather pointedly to the dole system of England, and we argued against it as strenuously as we knew how. It is now pertinent to ask what the situation is in England today relative to the dole. Never in human history has there been a more demoralizing adventure than the inauguration of the dole. Never before has a virile and self-reliant people been so sapped of their initiative, and energy. It has caught England by the throat and threatens to strangle her. It has robbed her of her best manhood and created in its place a lot of irresponsible and alms-begging paupers to prey on the body politic.

While panel dentistry is not in all respects comparable with the dole, it savors too much of the same kind of paternalism. As one of those who answered the questionnaire remarks: "Panel dentistry is a form of government ownership. Most governmental

positions are held by incompetent men. Panel dentistry would undoubtedly attract this type of man."

But a greater influx of incompetent men is not wanted in dentistry. Our profession is developing in a way to challenge the admiration of the world, and anything that tends to hamper its progress by the suppression of initiative or incentive is subversive of the best interests of the profession and the people. It is so unfortunate that it becomes almost pernicious. We want a higher rather than a lower standard in our profession, and we shall never achieve a higher standard through the medium of panel dentistry.

At this time, we have not the space to consider in detail the survey in children's dentistry, but we are glad to note the increasing interest in this subject as expressed by the answers to the questionnaire. We heartily endorse the concluding remark in the survey made by a New York dentist, "Children's dentistry ever, panel dentistry never." Let this be our slogan till such time as panel dentistry is no more, and children's dentistry is elevated to the status of a consecrated service.

AN ENCOURAGING SIGN OF THE TIMES

When a lay publication gives expression to a highly ethical attitude toward professionalism on the part of its staff, and publishes an editorial intelligently outlining the distinction between industrialism and professionalism, it is a sign that greater understanding among the laity in such matters is manifest, at least in certain quarters.

In the August 8 issue of the *Hamilton Spectator* (of Ontario) the editor, Mr. William Mulliss, gives expression to ideas that we feel sure must appeal to every thoughtful man, lay or professional, and we are accordingly quoting from it *in extenso.* He says, speaking of professional ethics:

> To a doctor a man confesses his fears, to a lawyer his mistakes and to a minister his weaknesses, the *Literary Digest* quotes the *St. Joseph News Press* as saying. This

is a neat, but by no means new, way of remarking that the man in the street places confidence in professional men. It is to the credit of the professions that this confidence is rarely abused, for if there is one thing upon which the professional man prides himself it is his honor. At one time it was thought there were only four professions open to a gentleman, the army, the navy, the law and the church. But our ideas of honorable service have expanded, to take in many more spheres of activity. Not only doctors of many kinds, but adepts in the use of words and figures are now included in the professional ranks. Adam Smith laid down the principle which divided the professions from other vocations. The trader is rewarded by money, the professional man not only by money but by public admiration. The greater the honor of the profession, the less the pecuniary reward and the more the reward of public admiration. That is to say, the professional man is one who gives real service, and is consequently entitled to honor and respect and public esteem.

John Ruskin, who had no love for Adam Smith's theories, seized upon this principle as one which should be adopted by business, and while he met with considerable abuse, business has begun to be permeated by his idea of real service, that is, not the "service" so-called which the customer pays for, but the service which is given gratis to the immediate reduction of profit but to gain of public admiration. Now, while business begins to adopt professional ethics, there is a contrary movement in the ranks of professional men. Happily it is a movement which is meeting with little success, but nevertheless it is there. This movement would degrade the professions. Its aim is to subvert the honorable principle of service upon which the professions are built, and to replace it by money-making. "Why should not a professional man get every cent he can out of his clients?" urge the advocates of this retrograde movement. "Are not the professions entitled to mulct the people?" We reply, "By no means," and for a very good reason.

The layman, when he has occasion to use the services of a professional man, is compelled by his ignorance to place confidence in him, and it was the recognition of this which led to the creation of what are known as professional ethics. A lawyer is pledged to give his client advice which will save his client's pockets and not line his own. A doctor is pledged to do his utmost to cure his patients and not to keep them in ill-health to his own profit. And so with the other professions. The members feel it to be a point of honor that they shall give their clients the best advice and service possible, disregarding their own immediate selfish interests. Upon this basis there has been erected that public admiration of which Adam Smith spoke.

Associated with circuses there has been for some time an individual known as a grafter. He is a man who sets up a game which professes to be one of skill, but which he so manipulates that the one who tries it wins only when the grafter wants him to win, that is, when the grafter sees an opportunity for landing bigger fish. A professional man, if he allows himself to be degraded by the movement which would exalt money-making over service, would become even more contemptible than the grafter, who is plainly a cheat. He could play upon the fear of his client or patient, or the love of relatives to enrich himself. He is in a good position to do so, when people come to him with confidence in his honor and integrity, but he would be a man beneath contempt. If such a practice were to become general the public would lose confidence in the professions, and with confidence goes honor. Fortu-

nately the professions have resisted the attempts made to undermine their integrity, and we commend them for it. But if they are wise, honorable professional men will not allow even the breath of suspicion to taint their profession. They will see that the men who would make their profession a grafting school are scrupulously kept outside.

Frankly, when we began to write this editorial we contemplated using only excerpts from Mr. Mulliss' remarks, but, on a careful analysis, we were unable to eliminate any of his statements and do justice to the subject. It is one of the most commendable and clear-cut documents that we have ever seen coming spontaneously from a lay publication, and we submit it to our readers as an example of the most exalted conception on the part of a deep thinker of what the true professional spirit really represents.

THE QUESTION OF PYORRHEA ALVEOLARIS

Much has been written on pyorrhea alveolaris, and many men have advanced theories as to its cause and its cure, but in the minds of the rank and file of the profession, there is still much confusion. One reason for this is the fact that pyorrhea is not always caused by the same thing. This is only too apparent if we study the manifestations that arise in every-day practice, and one of the chief limitations in the management of this disease relates to the fact that each operator seems to concentrate on a single cause or a single condition, and to confine his consideration to this one phase of the question. Most men have not sufficient breadth of vision to cope with this disease in its varying manifestations, and this accounts for the fact that there are so many practitioners who openly claim that pyorrhea cannot be cured. Of course, it cannot be cured in all cases, but it can be cured oftener than it is by the exercise of a wider grasp of the subject.

Even among the pyorrhea specialists, there is likely to be a narrowness of vision, one man claiming that pyorrhea is caused solely by deposits on the teeth, another that it is due mostly to traumatic occlusion, and still another that it is due to faulty diet

and is, therefore, wholly a systemic affection. One authority has made the claim that eighty-five per cent of pyorrhea pockets have their inception in the lodgment of food between the teeth through faulty proximal contacts. And thus the opinions differ, and the significant thing is that each advocate has a basis for his claim.

We assuredly know that there are certain cases in which deposits are the causative factor, for the reason that when the deposits are completely removed, the cases get well without further treatment. We know that traumatic occlusion causes some cases of pyorrhea because, as soon as the occlusion is remedied, the pus ceases, the teeth tighten and there are no further manifestations of the disease. We know that the constant lodgment of food between the teeth will bring about such an irritation of the gum tissue as to produce a pyorrhea pocket, and when the contact is remedied and the interproximal space made normal, the gum recovers.

Of these three manifestations, there can be no question, because the clinical evidence is conclusive and positive. Also, it may be said that our dietitians are claiming marvelous results in pyorrhea cases through the medium of diet, something with which we are less familiar than we are with the conditions just mentioned.

But this is not by any means the whole story. There is another side to the picture that sometimes confronts us. We encounter cases where there are no deposits, where there is no traumatic occlusion and no interproximal irritation, and where, as far as we know, the diet is satisfactory, and yet the supporting structures of the teeth go progressively on to absorption of the alveolar process, the pericemental membrane and the gum tissue, leading eventually to a loosening and ultimate loss of the teeth. There is a situation here that we have not solved—something that we do not yet know—and till the time comes when this condition is clarified, we shall not be able to absolve ourselves of a certain obligation that we owe the public who are suffering from this disease.

Too many people are losing their teeth from pyorrhea today. Some of it, with our present knowledge, seems unavoidable, but the majority of afflicted people might be cured, and all of them

might be relieved, by proper cooperation between the practitioner and the patient. There is an unfortunate attitude on the part of many members of our profession in their approach to the pyorrhea problem. The assumption that nothing can be done for pyorrhea is accountable for the loss of thousands of valuable teeth, and while volumes have been written on the subject, there remains the insistent necessity of rousing the profession to a realization of their obligation in the matter.

There is no longer any question that if pyorrhea is taken in its incipiency, it can be cured, or at least it can be kept under control, to the end that the natural teeth may be made to serve a more useful purpose in the economy of nature than they do at present. The greatest need is to accept each case as an individual problem, and to treat it in accordance with the indications that are manifest when the case is presented to us. As has just been said, all cases are not alike and the treatment is as varied as is the etiology. When this is generally recognized by the profession, there will be fewer teeth lost from pyorrhea.

AN AGREEMENT BETWEEN THE AMERICAN DENTAL TRADE ASSOCIATION AND THE AMERICAN DENTAL ASSOCIATION

An agreement has been reached between the A.D.T.A. and A.D.A. whereby the A.D.T.A. is to exhibit at the coming meeting at Memphis.

Through a series of misunderstandings which seem to arise at times in the lives of all men, the A.D.T.A. decided not to exhibit at Denver. Recently, representative committees from the two organizations got together and very promptly came to an agreement, with the result just stated. All parties are to be congratulated, because there is no good reason that these two great organizations should not work together in perfect unity and accord. Each needs the other in a very intimate way, and there is a community of inter-

est between the two that makes the welfare of the one practically the welfare of the other. Working harmoniously together there is hardly an achievement in the profession that cannot be consummated; and the prospect is bright just at this time for the development of some very promising enterprises in the near future.

DALLAS ELMER HARDENBROOK
(1887-1931)

Dallas Elmer Hardenbrook, of Oregon City, Ore., died July 7, at the United States' Veterans Hospital, Portland, Ore., after a five weeks' illness from leukemia.

He was born in Redding, Calif., forty-four years ago, the elder son of Mr. and Mrs. Abram Hardenbrook, of Gold Beach, Ore. He was graduated as an honor student from the North Pacific College of Dentistry, Portland, in 1915, and was married in 1916 to Mabel Personet, a graduate of the same school. He practiced in Curry County until the beginning of the World War, when he enlisted and was assigned as first lieutenant to the 346th Division of the Second Field Artillery, serving one year in France. After his return from the service, he became associated with the late Clyde Mount of Oregon City and continued the practice after the death of Dr. Mount, one year ago.

Dr. Hardenbrook's quiet reserved personality, coupled with unusual ability as a dentist, his high ideals and kindly manner, won him many friends. As a skilful technician, he frequently demonstrated his work at clinics. His principal diversion and recreation was target shooting and the building of ship models. He had devoted considerable time to securing special types of guns and numbered several valuable antiques in his collection.

He was a member of St. Paul's Episcopal Church and of the national, state and Portland district dental societies, besides being affiliated with the Veterans of Foreign Wars, the American Legion, Officers' Reserve Corps, American Riflemen's Association and local Kiwanis Club.

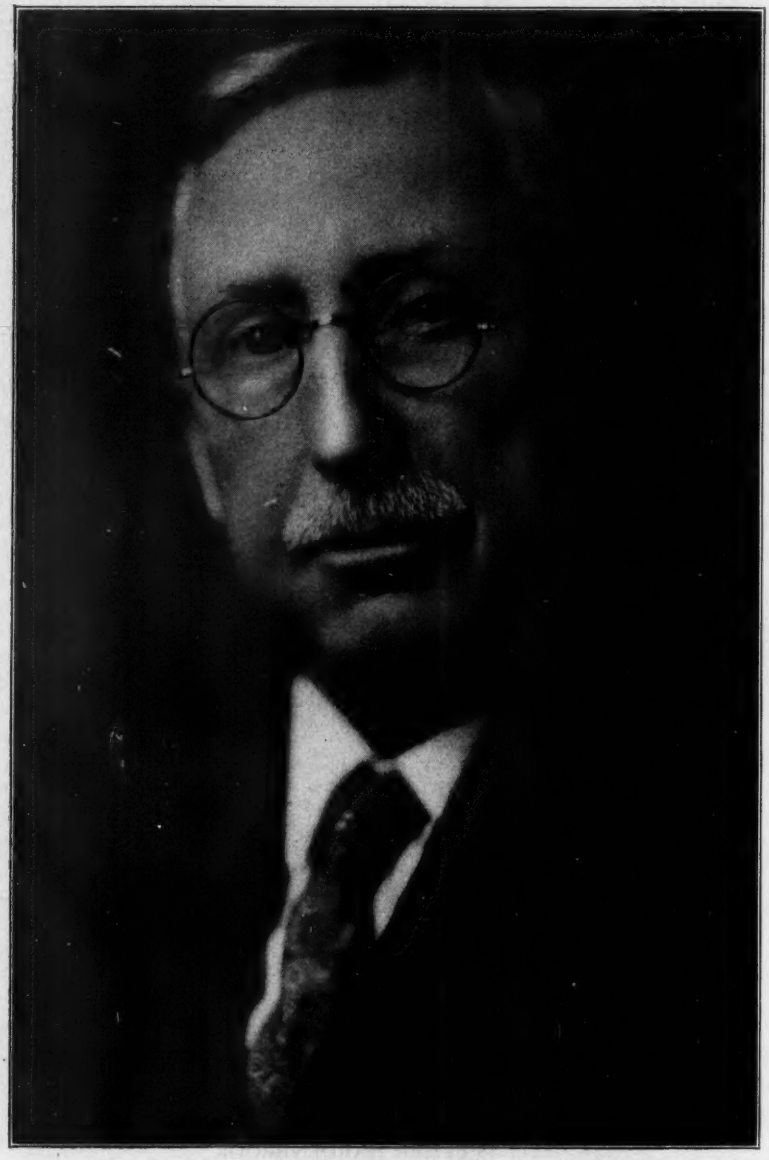
Dr. Hardenbrook is survived by his widow and their three daughters, Elizabeth, 10, Ruth, 9, and Ann, 6. ARTHUR F. WEEKS.

THEODORE VICTOR SMITH
(1879-1931)

The sudden death of Theodore Victor Smith will be much regretted by his many friends and patients. Dr. Smith was born in Westfield, N. J., in 1879 and was in his fifty-third year. He was the eldest son of Theodore Victor Smith and Annie Marguerite Clark Smith. His father was a highly respected physician.

His early education was taken in New Jersey and from there he went to the New York Dental College for one year, transferring to the University of Penn-

DALLAS ELMER HARDENBROOK
(1887-1931)



CHARLES EDGAR POST
(1860-1931)

sylvania Dental School, from which he graduated with the degree of D.D.S. in 1900. He was a demonstrator at this school from 1901 until 1903 and at the same time practiced in the city of Philadelphia.

In 1903, he came to England and took his L.D.S. R.C.S. (Eng.) and later became associated with Kirk Davenport and, in 1915, on Dr. Davenport's sudden death, he succeeded to the practice. He enjoyed a large practice. In 1922, he became a naturalized British subject.

Dr. Smith was a consistent and conscientious worker, displaying great energy and ability, an ardent student in the development and progress of all phases of his professional work, especially the study of orthodontics.

During the Great War, he was honorary dental surgeon to the American Women's Hospital for Officers and the American Red Cross. He was a member of the British Dental Association, the Royal Society of Medicine, the American Dental Society of London and the American Dental Society of Europe, of which he was president for 1930-1931, and he presided at Paris less than a month ago.

In 1901, he married Emma May Johnson, who survives him. The deepest sympathy of the profession is extended to Mrs. Smith. F. ROUS MALLORY.

CHARLES EDGAR POST
(1860-1931)

Charles Edgar Post was born in Henry, Ill., April 7, 1860. His antecedents were numbered among the pioneers of the Atlantic coast. On his mother's side, a forbear was one of the original founders of Newark, N. J., in 1666, and another served in the Continental Army in 1776.

His youth was spent in Illinois on a farm and environmental influences tended to mold his inclinations toward a farmer's life. He came to California in about 1876 and, after serving as an apprentice in the office of his brother-in-law, Leander Van Orden, for one year, he matriculated in the College of Dentistry, University of California, March 1, 1886. After two successive terms of nine months each, he was graduated, receiving his degree of Doctor of Dental Surgery, Nov. 30, 1887. For three years he engaged in practice with Dr. Van Orden in San Francisco. In 1890, his license was registered in California, and he opened his own office, where he continued to practice, with the exception of a period from May, 1920, to July 1, 1922, until the day of his death. For nearly forty-four years, he worked at his chair.

The records of the activities of the dental profession in California are replete with reference to his service to it and to the public. Those who knew him well remember his faithfulness to the standards and ideals of his profession. Challenging every departure from the principles of the Code of Professional Ethics with a zeal akin to patriotism, he not infrequently disturbed the tranquillity of the conventions in debate and disputation in which he participated for the betterment of dentistry, only to broaden his influence and widen his circle of friends among his colleagues, because of his sense of honor. For these ideals, his profession conferred on him signal distinctions.

From 1891 to 1894, he served as demonstrator in mechanical dentistry in the College of Dentistry from which he was graduated. In 1897, he became a member of the clinical staff of his alma mater, in which capacity he acted until 1916, when this instructional activity was discontinued. July 1, 1922, he returned to service in the university as clinical instructor in operative dentistry, which position he held for seven years. He also served as a member of the board of trustees of the alumni association from 1909 to 1912 and from 1913 to 1920.

His greatest contribution was in his service to the California State Dental Association. Intimately acquainted with its founders, he saw it grow from a membership of sixty-nine, in 1889, when he was admitted, to a membership of about 1,475.

He served his colleagues in this association as corresponding secretary from 1892 to 1895, as recording secretary from 1900 to 1912, and as president in 1914 and 1915.

Ever on the defensive for his association, espousing its noble purposes and accomplishments, his service will be remembered by those who knew him in these capacities as one of his worthiest efforts.

He was a member of No. 1 Lodge of the Independent Order of Odd Fellows, in San Francisco, and an honorary member of the Second District Dental Society (Santa Clara District).

Membership in Delta Sigma Delta meant to him a further opportunity for service, which he never neglected.

Loyal to his alma mater every hour of his professional life, dutiful to his profession, in office and as a member, faithful in service to his patients, considerate of his friends, and affectionate in his family life, he builded his character well.

No resolution of sympathy or condolence to his family carried with it as much sincerity as did the presence of those friends who gathered in numbers to pay their last respects at his bier.

GUY S. MILLBERRY.

DEATH OF MRS. HENSHAW

Mrs. Frederic R. Henshaw, wife of the dean of the Indiana Dental College, passed away on August 28, after a brief illness from pneumonia. Dean Henshaw may be assured of the sympathy of his wide circle of friends.

COUNCIL ON DENTAL THERAPEUTICS

ACCEPTED DENTAL REMEDIES

The following articles have been accepted as conforming to the rules of the Council on Dental Therapeutics of the American Dental Association for inclusion in the list of Accepted Dental Remedies. The Council desires dentists to understand that the admission of an article does not imply a recommendation. A copy of the rules which govern the Council in the consideration of articles will be sent on request.

Samuel M. Gordon, *Secretary.*

AMMONIACAL SILVER NITRATE.—A solution prepared from silver nitrate and ammonium hydroxid, containing about 30.4 per cent silver as $Ag(NH_3)_2OH$. It darkens on exposure to light and unless freshly prepared should be kept in dark colored containers.

It is incompatible with acids, soluble chlorids, bromids, and iodids, proteins, tannins and with most reducing agents.

Fresh solutions are preferable and may be prepared by adding 2.5 c.c. of 28 per cent ammonia (aqua ammonia fortior) to a solution containing 3 gm. of silver nitrate in 1.0 c.c. of water. The solution should be clear and should have no odor of ammonia. An equivalent solution may be prepared according to Rickert's directions. To 2 or 3 minims of ammonium hydroxid in a transparent container, add silver nitrate until no more can be introduced without producing a yellowish brown precipitate. If too much silver has been added, a very small amount of ammonium hydroxid will carry the precipitate back into solution. On standing, the dry preparation may explode, and due caution should be observed.

These solutions are used in conjunction with reducing agents such as eugenol and liquor formaldehyd for depositing metallic silver at the desired point. The choice of reducing agent depends on conditions of the gangrenous area.

Action and Uses: The use of silver nitrate as a means of abating the incidence of dental caries was introduced into dentistry as early as 1846. The silver salts form resistant precipitates with proteins which act to limit their penetration in vital teeth and in those immediately following pulp extirpation. The end product of the application of silver nitrate to carious areas is probably a mixture of silver proteinates and reduced silver, due to the action of light and other reducing agents. In order to hasten the reduction of the silver salt, the use of the complex silver ammonium hydroxid ($Ag(NH_3)_2OH$) was introduced. The solution as prepared above contains a high percentage of reducible silver. It is claimed that it is less toxic than silver nitrate *per se.* Its most important use in dental

practice is due to its ready diffusibility into the dentin. The finely divided silver which is laid down by this process in carious dentin retards the progress of dental decay. When judiciously used, it is said to completely arrest the course of caries.

When properly used, ammoniacal silver nitrate is useful in root surgery. The action depends not only on its bactericidal properties but also on the fact that it combines with the toxic products of protein cleavage and other toxic properties in such conditions as gangrene of the pulp.

The insolubility of the finely divided silver in the circulatory elements and the high tolerance of the tissues toward it has made it a useful agent in conditions mentioned above. The oligodynamic properties of silver inhibit the growth of bacteria. On account of its staining propensities, its use is generally confined to the posterior teeth.

When a thorough diffusion is desired, as in the treatment of toxic roots, the silver solution, without the use of a reductant, may be sealed in for a number of hours.

Ampoules Ammoniacal Silver Nitrate.—P. N. Condit. Solution ammoniacal silver nitrate. Each ampoule contains about 2 c.c. of ammoniacal silver nitrate prepared according to the directions of Percy R. Howe (*Dent. Cosmos,* 59, 481, 1917.) These ampoules are accompanied by ampoules containing 2 c.c. of a solution of formaldehyd, approximately 10 per cent.

Action and Uses: (See preceding article on ammoniacal silver nitrate solution.)

Dosage: For use in prophylaxis against dental caries, a drop or two of the solution is applied to the carious area and reduced with eugenol or formaldehyd solution. For use in gangrenous pulp, a drop or two is applied locally and followed by the application of eugenol or formaldehyd solution, 10 per cent. A special applicator is furnished by the manufacturer.

Prepared by P. N. Condit, Boston, Mass. No U.S. Patent. Trade Mark No. 167462.

CALCIUM GLUCONATE.—Normal Calcium Gluconate.—Calcium salt of hexapentol—(2, 3, 4, 5, 6)—Acid—(1).—Calcium salt of $\alpha\beta\gamma\delta\varepsilon$ pentoxy-pentane-carbonic acid.—$[HOCH_2CH(OH)CH(OH)CH(OH)—CH(OH)COO]_2Ca.H_2O$. It contains calcium equivalent to not less than 12.40 nor more than 12.80 per cent of calcium oxid.

Actions and Uses: Calcium gluconate is used to obtain the therapeutic effects of calcium. It is more palatable than calcium chlorid or lactate for oral administration. Its use in connection with otherwise ample diets has been suggested for the treatment of sensitive cervices of teeth (J. A. D. A., 18:156, 1931), but this requires further confirmation.

Dosage: Orally, for adults, 5 gm. (75 grains), three times a day; for children, 2 gm. (30 grains), three times a day.

Calglucon: A proprietary name for calcium gluconate.

Manufactured by the Sandoz Chemical Works, Basle, Switzerland, (Sandoz Chemical Works, Inc., New York, distributor). U. S. Patent 1,648,368.

Tablets Calglucon: Each tablet contains 1.5 gm. (23 grains) calcium gluconate flavored with chocolate.

SODIUM PERBORATE, N.F.V.—Sodii Perboras—Sodium perborate $NaBO_34R_2O$ is the sodium salt of the hypothetical

acid—perboric acid. It should yield not less than 9 per cent of available oxygen.

Sodium perborate occurs as a white, granular or powdered salt, odorless and soluble in water; the solution has a saline taste. It is decomposed by water into hydrogen peroxid and sodium metaborate, $NaBO_3+H_2O=H_2O_2+NaBO_2$ producing an alkaline solution. It is decomposed by catalyzers, ferments and animal tissues. Heated to 60 C. (140 F.), it evolves oxygen, and when heated to a higher temperature, it gradually loses all its available oxygen and water of crystallization.

Action and Uses: Sodium perborate is an antiseptic deodorant, and bactericide and is used in wounds, purulent sores, etc. It is used extensively in cases of Vincent's infection because of its *supposed* property of liberating oxygen when in contact with mouth tissues, and is an ingredient of many tooth powders. It has been observed that sodium perborate does not liberate all the available oxygen at the reaction of the mouth fluids. In general, it is used in place of hydrogen peroxid, over which it has the advantage of yielding an alkaline solution. It is applied in substance or in solution. Three grams dissolved in enough water to make 100 c.c. yields a solution containing 2 volumes of oxygen.

Non-proprietary preparation.

Sodium Perborate, Flavored, Merck.

Manufactured by Merck & Co., Inc., New York City. No U. S. Patents or Trade Mark.

NABOC TOOTH POWDER.—*Composition:* Each 100 gm. contains soap (vegetable), 12 gm.; precipitated chalk, 82.6 gm.; sodium perborate, 3.0 gm.; aromatics, 0.9, and saccharin, 1.5 gm.

Claims: The manufacturer does not make any claims of a chemical, bacteriologic or therapeutic nature. Naboc is offered for whatever ability it may have to clean the surfaces of the teeth when used in conjunction with the toothbrush.

Manufacturer: Naboc Company, New York City. No U. S. Patent. Trade Mark No. 267,222.

PEBECO TOOTH PASTE.—*Composition:* Each 100 gm. contains precipitated chalk, 19.98 gm.; potassium chlorate, 41.62 gm.; stearic acid, 2.15 gm.; sugar and glycerin, U.S.P., 14.87 gm.; water, 19.13 gm.; binder, 0.72 gm., and flavor, 1.53 gm.

Claims: The manufacturer limits the claims to its use as a cleansing agent. The firm has stated that it proposes to make no claims based on the presence of a sialagogue, nor do they propose to make claims contrary to the provisions of the Council for dentifrices, i.e., claims of a therapeutic, chemical or bacteriologic nature.

The Council has reviewed the pertinent literature on the toxicity of potassium chlorate *in tooth pastes*. Reports are frequently found showing the toxicity following the ingestion of large amounts of potassium chlorate, but no reports are found on the toxic action following its use in a dentifricial manner, such as possible frequent or virtually continuous oral and gastrointestinal absorption and effects on remote functions and organs, such as the kidney, in which a slow and insidious injury is conceivable. Chlorate is nephrotoxic. The experiments of Gies

(*J. Dent. Res.*, 2:313 and 511, 1920) indicating that potassium chlorate was less toxic than sodium nitrite, castile soap, sodium oleate, potassium chlorid and potassium sulphocyanid to newts and tadpoles and after vein injection, and the absence in the literature of reports of definite injury following the use of potassium chlorate in a dentifrice influenced the Council to admit Pebeco Tooth Paste to Accepted Dental Remedies, because its present method of marketing complies with the provisions of the Council for dentifrices.

Owing to the lack of desirable evidence on the actions of potassium chlorate under dentifricial conditions, the Council desires to point out the desirability of conducting investigations of chronic intoxication with small doses of potassium chlorate alone or in a dentifrice.

Manufactured by Pebeco, Inc. Lehn and Fink, Inc., Bloomfield, N. J., Distributor. Trade Mark No. 229966. No U. S. patent.

SQUIBB'S DENTAL CREAM.—*Composition:* Milk of magnesia, U.S.P., 55 c.c., precipitated chalk, 36 gm., glycerin, 61 c.c., flavoring oil, 0.8 c.c. Prepared into a dental cream by the aid of suitable excipients to produce 100 gm. of the finished product, eliminating excess water in the process.

Claims: The company agrees to make no claims of a chemical, therapeutic or bacteriologic nature. No claims except that it is a cleansing agent are to be made until evidence for other properties has been submitted to the Council and found acceptable to it.

Manufacturers: E. R. Squibb and Sons, New York City. U. S. Patent No. 1,536,305.

REPORT ON PLASTIC MATERIALS

The Council has authorized publication of the following preliminary report.

Samuel M. Gordon, *Secretary.*

The germicidal efficiency of selected dental cements has been the subject of some controversy during the past twenty years. Fraser[1] reports that both black and red copper cements possess germicidal properties which are inconstant and which vary within relatively wide limits. The zinc oxid cements, as well as the various types of guttapercha filling materials, do not possess any germicidal properties. In addition to the cements, work has been done on copper amalgam, and the report states also that if copper amalgam can be protected from the action of oral fluids, its marked germicidal efficiency is greatly lengthened. It is well known that when this amalgam is exposed to saliva, it becomes gradually permeable to fluids, and disintegrates.

Careful tests made from the bacteriologic standpoint indicate that these plastic fillings deserve a more general application in dentistry than they enjoy at present. In the treatment of "deep seated" caries, it would seem that a carefully placed lining

1. Fraser, C. Jane: Dominion Dent. J., 37:1 (Jan.) 1925; J. Dent. Res., 9:507 (Aug.) 1929.

of red or black copper cement, or of copper amalgam, would have a more lasting germicidal effect than a paste made of zinc oxid and eugenol.

There is another aspect of the question which relates to the problem of pulp infection and pulp necrosis. This has to do with the properties of various silicate cements, "synthetic porcelain" cements and plastic materials of a similar character. There have been repeated instances in the clinic of dental pulps dying under large silicate restorations. An inquiry into this matter has been made by many research workers and their findings at the present time may be summarized as follows:

Silicate cements, without regard to manufacture, or even method of mixing, are impermeable to bacteria. Furthermore, they contain substances which exert a hemolytic action on erythrocytes. This is due, apparently, either to the liberation of acid or acid salts during the first hour of setting. Therefore, the shorter the plastic stage, the less harmful the cement. It has been found that pigments play only a small part in the reaction. Pulp necrosis occurs more often in hypoplastic teeth than in teeth with normal dentin and cementum. The greater the extent of the dentin hypoplasia, the more surely will pulp death follow the insertions of large restorations of "synthetic cement" or "synthetic" porcelain.

All silicate cements have been found to show considerable shrinkage. This plastic material consists of two parts, a powder containing basic fluorids and a liquid containing acid phosphates. The equation suggested as representing the reaction occurring between these two substances is as follows:

$$2H_3PO_4 + 3MF \longrightarrow 6HF + M_3(PO_4)_2$$

in which M is a monovalent metallic radical.

Doubleday[2] has a different theory. He concludes that the toxic action of silicate cement fillings is due to the presence of orthosilicic acid and unsaturated aluminum phosphate. These fillings undergo slow chemical disintegration when placed in the mouth, and, as a result, the colloidal solution escapes from the cavity and injures not only the gingival epithelium and subjacent structures, but the dental pulp as well.

It is suggested that useful information could be obtained if comparative tests were made of the various copper amalgams and copper cements, and the results of these tests referred to the manufacturer for comment. One of the most important aspects of preventive dentistry is that dealing directly with the conservation of dental pulps in both deciduous and permanent teeth. If the profession is using, unknowingly, plastic filling materials which eventually prove harmful to the dental pulp, it is time to change the method of filling, and to substitute for it one which will to a greater extent conserve the dental pulp from chemical poisoning or from infection from caries or oral organisms.

2. Doubleday. F. N.: Brit. Dent. J. 47:493 (May 1) 1926.

BUREAU OF CHEMISTRY

DR. HUBBEL'S FORMULA

DR. HUBBEL'S Formula is a preparation put out by the Hubbel Products Corporation, Boston, Mass. Officials of the Government examined samples of the product which had been shipped in interstate commerce. The examination revealed that statements appearing on the label were false and fraudulent, since Dr. Hubbel's Formula contained no ingredient or combination of ingredients capable of producing some of the following effects claimed:

"A Sure Remedy for Pyorrhea Trench Mouth, Sore and Bleeding Gums, Hardens Gums, Tightens Teeth."

The following testimonials (presumably lay) used in connection with the sale of the product were also alleged to be false and fraudulent:

Your preparation for the cure of Pyorrhea has done wonders for me in hardening up the gums and tightening up loose teeth. F. S. H. Allston.

I cannot praise Dr. Hubbel's Formula for treatment of Pyorrhea enough. I suffered with Pyorrhea. My teeth were loosened from the gums and it looked as if I were going to lose them. I started using your formula about two months ago and today find my gums healed and my teeth quite sound once more. A. A. Boston.

I know that you will be interested to hear how well my gums are after having six (6) applications of your formula. Ten years ago I first noticed how very bad and inflamed they were and naturally went to the dentist. He told me that I had a "trench mouth" and would in probability be troubled with it. Some treatments were given me which helped a little for the time being, but I have always had to return to him every two or three months. Now my gums are one hundred per cent better and I want you to know how much I appreciate having found a cure. E. A. J. Quincy.

I have found Dr. Hubbel's Formula a most effective remedy for bleeding gums. The application of the medicine stops the bleeding practically at once and hardens the gums. It acts also as cleanser and disinfectant and I can heartily recommend its having a place in every family medicine chest. A. H. J. Brookline.

Further statements quoted in the Notice of Judgment are as follows:

Dr. Hubbel's Formula is both a preventive and curative remedy. In cases where the infection has located itself, either as an aggravated condition or simply in the early stages, Dr. Hubbel's Formula corrects the condition by strengthening the unhealthy or sensitive gums and causes a hardening or toughening of the gum tissues.

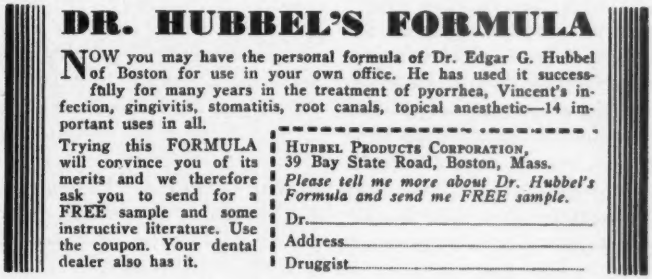
Dr. Hubbel's Formula is used by dentists in treating the most advanced stages of gum disorders and is highly recommended by many of the leading dentists throughout the country . . . the only result which can occur from its application is an immediate benefit and continued improvement until the mouth is restored to a normal, healthy condition.

Analysis of a sample of Dr. Hubbel's Formula by Government chemists showed that it consisted essentially of chloral hydrate, volatile oils including camphor, eucalyptol and clove oil, formaldehyd, acetic acid, sulphuric acid, small proportions of extracts of plant drugs, alcohol, and water, colored green.

In February of 1931, the United States District Court for the District of Rhode Island ordered that the product be destroyed by the United States marshal. (Abstract from Notices of Judgment 17905 and 17907, issued, June, 1931.)

Dentists will be interested in reading the accompanying advertisement, from the September, 1931, issue of a dental periodical.

Possibly the Hubbel Products Corporation can furnish scientific proof to the profession that their product will cure pyorrhea when used by the laity. Perhaps, the dental periodical referred to above can enlighten the profession as to how the interests of dentists are being served by advertising a product some of the statements regarding which were adjudged false and fraudulent by a United States District Court.



DR. HUBBEL'S FORMULA

NOW you may have the personal formula of Dr. Edgar G. Hubbel of Boston for use in your own office. He has used it successfully for many years in the treatment of pyorrhea, Vincent's infection, gingivitis, stomatitis, root canals, topical anesthetic—14 important uses in all.

Trying this FORMULA will convince you of its merits and we therefore ask you to send for a FREE sample and some instructive literature. Use the coupon. Your dental dealer also has it.

HUBBEL PRODUCTS CORPORATION,
39 Bay State Road, Boston, Mass.
Please tell me more about Dr. Hubbel's Formula and send me FREE sample.
Dr.
Address
Druggist

Advertisement from the September, 1931, issue of a dental periodical.

BUREAU OF DENTAL HEALTH EDUCATION

EDUCATIONAL PROGRAM ON DENTISTRY FOR CHILDREN IN MICHIGAN

By WILLIAM R. DAVIS, D.D.S., Lansing, Mich.

MICHIGAN has recently undertaken an educational project for the profession on children's dentistry that promises to be so much worth while that the Supervisor of Dental Health Education of the American Dental Association has requested that it be set forth for publication.

This development came about in connection with a general plan for extension education by the Michigan State Dental Society. At the annual meeting of the society in May, 1930, a resolution was presented, discussed and unanimously adopted favoring the development of a program of extension education by the council of the society. In accordance with this resolution, at a meeting of the council following its adoption, the president was authorized to appoint a committee of five to study the possibilities of such a project on the part of the society and report its recommendations at the next meeting of the council, in November. The president appointed M. Webster Prince, of Detroit, chairman; O. W. White, Detroit; Raymond Girardot, Detroit; M. L. Ward, Ann Arbor, and William R. Davis, Lansing. This committee had several meetings, discussed the matter thoroughly and unanimously recommended to the council that it authorize a committee and develop educational programs on the following subjects: 1. A better understanding of the business side of dentistry. 2. The status of the present state dental law and requirements for its enforcement. 3. The practice of children's dentistry. 4. The problem of providing dental health service to all types of patients and the part the dental profession should take in helping solve this problem. The council unanimously adopted this report, authorized the same committee to proceed to develop such a program and placed sufficient funds at its disposal to begin work on this task.

The committee has endeavored to proceed with care and judgment, as it takes time to develop such a plan in the most efficient and economical manner. So far, a children's dentistry program has been developed and one on some essentials of success in dental practice.

Being engaged in dental public health promotion, I have long recognized the need for a sane, constructive program on dentistry for children that would appeal to the dentist in general practice and which could be taken to small groups of dentists in various sections of the state. Consequently, I was prepared to recom-

*Director, Bureau of Mouth Hygiene, Michigan Department of Health.

mend such a program to the committee and received its authority to carry it out. Walter C. McBride, of Detroit, was secured to put on the program, which was worked out as follows:

Lunch promptly at noon to be followed at 12:45 by a lecture on "The Management of the Child Patient"; 1:30, "Clinic and Operative Procedures for Children's Dentistry," using models and blackboard; 3:00, a clinic in one of the dental offices on actual cases; one in a child of 3 or 4 who had never been in a dental office and with some filling necessary; one in a child of 6 or 7 with a difficult interproximal filling in a deciduous molar; one, an extraction case, under nitrous oxid-oxygen (in addition, as far as time permits, other cases are examined and discussed); 7:00, dinner followed by a lecture on the "Business Side of Children's Dentistry," followed by questions and general discussions. This program was tried out in Muskegon and Holland last spring and its success exceeded our most sanguine expectations. The following quotations from letters received by the committee attest its enthusiastic reception by the local dentists.

We had the most interesting day with Dr. McBride yesterday. Not only was it interesting, but I believe it was highly instructive and educational, and certainly ought to bring about some good results. I think that this program is one of the best things that the State Dental Society has sponsored for a long time.

Arend Vyn, *President,*
Muskegon Dental Society.

I wish to convey to the Educational Committee the thanks of the Muskegon Dental Society for sending us Dr. McBride. We feel that through this type of extension service the State Society is doing something of a truly constructive nature.

May I also congratulate your committee on their choice of clinicians. Dr. McBride has a really worth while message for the profession, and he gives it to them in a manner both pleasing and instructive. Just to say that he was well received by the men of this locality is putting it mildly; they were really enthusiastic. Each man felt that his day had been profitably spent, and that he was taking something of real value away with him.

R. W. Christie,
Local Program Chairman.

The Holland Dental Society feels that your committee are all that the name implies, and thank you for the excellent clinic put on last Tuesday by Dr. McBride. We don't see how it could be improved. We had a 100 per cent attendance of our dental society. The boys are all very enthusiastic about it, and are looking forward to anything you may have to offer in the future."

M. J. Cook, *President,*
Holland Dental Society.

At the close of the program, the dentists were asked for suggestions and whether the proceedings could be shortened. Without exception, the reply was: "We wouldn't want to have missed a single part." Frequent comment was made on its practical value for the general practitioner. Frills suitable only in exclusive practice were not presented. A high type of service was presented—such a service as every dentist must render, if it is to be satisfactory and not fraught with unpleasant reactions.

We should add that careful plans were put in motion beforehand. The educational committee requested the local dentists to invite every ethical local dentist in the community whether a member or not. This would extend the influence of the program farther and at the same time create a favorable impression on the nonmember which ought to result in increased membership later. In addition to a strong local committee to make necessary local arrangements and make personal efforts toward attendance, this committee was asked to furnish the educational committee with a corrected list of ethical dentists in the community, and a

cordial invitation also went out from the educational committee to every dentist individually. With the invitation, the following was enclosed:

DENTISTS, ATTENTION!

Many schools in Michigan are using a card for the dentist to sign stating that the child needs no dental attention or that necessary dental work has been completed. This is a method used in many parts of the country and has been found most successful in stimulating interest in the care of the mouth of school children especially when used in room competition and as marks of honor.

However, many instances have been found where the dentist has signed such a card when fillings and extractions were very much needed and had not been completed. *This defeats its very purpose and is a serious injustice to the child, the profession and the community.*

If the child will not allow the work completed or parents are unwilling or unable to pay for same this is unfortunate, but surely does not call for the signing of a completion card by the dentist unless the work is actually done. The amount of charity work the dentist does is his own affair; the care of indigent cases is a community problem which the dentist cannot solve alone; but the following conditions should be met before the card is signed:

Dental Requirements for Honor Enrollment of Health Contests

1. The teeth should be reasonably clean. If calculus is present it should be removed and any gum inflammation or infection should be cleared up.
2. All cavities in deciduous or permanent teeth should be filled including pit and fissure defects of enamel where a fine explorer point will penetrate the enamel. (Exceptions—broken enamel on deciduous teeth that are self cleaning with no root or nerve involvement and soon to be shed, or teeth that are to be extracted.
3. All deciduous or permanent teeth that cannot be successfully treated and filled should be extracted, including all spicules of deciduous roots remaining in the mouth.

Parents' attention should be called to the value of orthodontia when needed but inability to have it done does not preclude signing cards.

Dental and medical authorities are agreed today that abscessed or putrescent teeth should not remain in the mouth *at any age.*

Parents are being educated to the value of dentistry as a necessary health service for their children. The dentist who does not deliver such a health service and says "leave them alone" may see his practice drifting elsewhere.

Public Health and Oral Hygiene Committee of the Michigan State Dental Society:
Dorothy G. Hard, D.D.S., Chairman, Ann Arbor,
S. E. Rice, D.D.S., Detroit,
A. C. Thompson, D.D.S., Detroit,
B. F. Miller, Jr., D.D.S., Flint,
W. W. Gibson, D.D.S., Grand Rapids.
Children's Fund of Michigan,
K. R. Gibson, D.D.S., Director, Dental Division, Detroit,
Michigan Department of Health,
Wm. R. Davis, D.D.S., Director, Bureau of Mouth Hygiene, Lansing.

This requirement for dental health also helped to focus the attention of the dentist on children's dentistry and suggested questions for discussion.

There is no doubt that the attitude of the rank and file of the dental profession toward children's dentistry has been changing rapidly of late. The demand created by public health education has been bringing this about, and the present economic situation is a contributing factor of no small importance which makes the present an especially opportune time for such clinics. Right now, the dentist can't afford to neglect any of his patients. At any rate, great interest is manifest.

Requests for this clinic are coming in from all over the state, and the educational committee plans to send it to as many places as possible during the coming year.

All told, this extension service promises very far reaching results in behalf of better dental service for children and also for organized dentistry.

THE IOWA PLAN FOR DENTAL HEALTH EDUCATION*

By THOMAS A. GARDNER, B.A., D.D.S., Iowa City, Iowa

THE Iowa plan for dental health education exhibits a departure from the usual accepted forms of state wide dental programs. The differences are several in number: 1. The program is not promoted by the organized dental profession of the state. 2. No "clinics" are held. 3. Mouth examinations are made largely by the family dentist in his office. 4. The value of the school dental clinic is minimized. 5. The plan reaches the rural schools as well as the towns and cities. 6. The program is conducted as an educational project rather than a dental "campaign." 7. The plan is flexible.

Before discussing each of the foregoing, it is necessary to tell something of the history of our organization. The plan of organizing school dental programs on a state-wide basis started in Iowa in 1927 as a part of the Sheppard-Towner activity as directed by the state university. George H. Wandel directed the work during its first year. Such satisfactory results were secured that the university, in 1929, saw fit to continue the program after federal aid had been discontinued. The bureau of dental hygiene was then assigned to the college of dentistry for direction. An advisory committee was formed, one member being the chairman of the oral hygiene committee of the state dental society, but the control and promotion remained in the hands of the university. The bureau has the complete endorsement and cooperation of all public health organizations within the state. Our chief helper has been the Iowa Tuberculosis Association. The personnel of the bureau consists of a director, a public health nurse for field work and a secretary. The storing and shipping of literature is done by the extension division of the university. The budget for operation has been approximately $11,000, but is considerably less for 1931-1932.

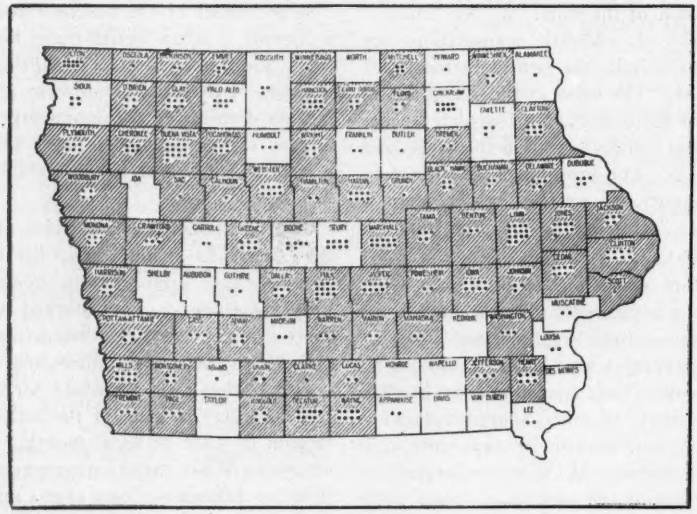
Let us discuss the first point of consideration. In many states, the dental societies have promoted the mouth hygiene movement without marked success, there being, of course, a few exceptions. In view of the many failures, one might conclude that it is a mistake for organized dentistry to attempt the active promotion of state or local mouth hygiene programs. When the situation is analyzed, it is not difficult to discover the etiologic factors. It is found that the dentist is entirely without his realm when promotion is attempted; he is not properly prepared for the task. He is not a trained teacher nor an educator, is not a trained public health worker, is not founded in the fundamentals of social welfare and knows virtually nothing of publicity and organization. Furthermore, the promotion of the programs by the dental societies exposes them to the accusation of

*From the State University of Iowa, Bureau of Dental Hygiene.

commercial propaganda; which, in turn, prevents the fullest of cooperation from the teachers and parents. In view of these facts, is there any wonder that, in the past, thousands of well-intended dental programs have failed?

Within the Iowa dental plan, the programs have been promoted almost exclusively by the bureau and other health organizations by interesting the teacher, superintendents and nurses in the activity as an educational health project. It is basis. We do not mean to suggest that dentists have had nothing whatever to do with the program in Iowa, for they have given us invaluable counsel and advice through the oral hygiene committee of the state society. The activity has thus been whole-heartedly endorsed.

In solving school dental program problems, the dental societies should work through committees and the committees, in turn, through the health workers, superintendents or other key persons, and



Map showing dental health activity of rural Iowa schools. The rural schools of all counties shaded were active during 1930-1931 (total, sixty-eight). For 1931-1932, the total will be approximately eighty. The dots represent towns, cities, and consolidated schools that ordered supplies for dental programs, a total of 415.

these persons who are especially trained for educating the children. Each is an expert in his field, and dentists without such training should not expect to be able to present dental health effectively to the pupils in the classroom. Let us stay within our limitations. Success can be secured on no other than an educational this without undue publicity. Otherwise, well-intended public spirited intentions may be misconstrued. Each state should have a well-organized plan of dental health education which might be followed by its schools and serve as a guide for the nurses, hygienists, teachers, superintendents and dentists.

No clinics are held. By "clinics," we mean the wholesale examination of the pupils by the community practitioners. The principal objection to this method is that whatever good it might accomplish may be more easily, tactfully, and effectively brought about by other means. To explain: We have observed that there is but a slight relationship between a school dental inspection and a successful dental program. Mere mouth inspection has rarely been attended with encouraging results. In the past, it appears that the superintendents, teachers and dentists have felt that it should be a sufficient incentive to accomplish all dental health objectives; but this has not proved the case. The difficulty is that most parents and pupils require something more than a knowledge of the presence of physical defects in order to have them remedied. Mankind is relatively an inert substance: we must be pushed, coerced or enticed into action. Consequently, the success of the school dental program is directly dependent on the ability of the superintendent and nurse to interest the teachers in interesting the pupils and parents, and not on an inspection. The teacher is the keystone of the arch.

The question is asked, Why not supplement the inspection made by the dentists with a program of education? It is granted that this will be many times

DATA ON DENTAL HEALTH ACTIVITIES

Towns and Cities	1927–1928	1928–1929	1929–1930	1930–1931
No. towns ordering supplies	58	60	241	415
Enrollment in such schools	35,532	35,011	78,868	125,000
No. towns reporting results	?	53	150	287*
Enrollment in such schools	?	33,799	62,296	95,540*
No. pupils on dental honor roll	?	17,077	30,367	51,114*
Percentage	?	50.5	48.9	53.5*
No. 100 per cent towns	?	?	4	8
No. 100 per cent rooms	?	?	147	441
Rural Schools				
No. counties ordering supplies for rural schools	11	11	40	68
Enrollment in such schools	16,567	16,567	65,911	101.345
No. counties reporting results	?	8	37	66
Enrollment in such schools	?	12,596	51,056	65,479‡
No. pupils on dental honor roll	?	5,874	15,704	39,026
Percentage	?	46.6	30.7	59.6
No. 100 per cent rural schools	?	?	227	500
Total 100% rooms and rural schools	?	?	374	941
Total enrollment, active towns and rural schools	?	46,395	113,352	161.019
Total pupils on dental honor roll	?	22,951	46,061	90,140
Percentage of corrections for entire group	?	49.4	40.6	55.9

*1930-1931 returns incomplete.

‡This enrollment is based upon only the rural schools that reported one or more dental corrections. It is therefore not quite comparable to the 1929-1930 report.

more effective than with the inspection alone; but if the same or better results can be secured by eliminating the inspection and substituting therefor a program of education, why not save the time, energy and expense and avoid the undesirable public accusations that are incident to the dental inspections? That this theory is workable has been demonstrated in Iowa in 5,000 rural schools and hundreds of towns and cities.

A further weighty reason for the elimination of the school room inspection by the community dentists is that approximately 85 per cent of our children are in need of dental service once or twice each year. Therefore, in the interest of efficiency and economy, this type of classroom inspection should be abolished and all efforts directed toward urging a visit to the family dentist and the development of a program of dental health education. Hence, in our opinion, the dental "clinic" is an unnecessary evil.

An argument frequently used for favoring the inspection is the value of the statistics for publicity and the measurement of results. But school dental statistics have little value unless made by the same person from year to year. Then, too, there are towns and cities that have had such information collected by the school dentists for many years at an expense of thousands of dollars and can show nothing but statistics for the money expended; and the tragedy is that last year's figures look quite similar to those gathered ten years ago. No one can justify the gathering of statistics at such a price. Our objectives are dental corrections and prevention, not the collection of statistical information. The annual expenditure of the same or less money on a program of education will accomplish much toward preventive dentistry. If a school system insists on statistical data, we advise that the school nurse, trained for dental inspections, or the dental hygienist may make as adequate and as accurate an inspection as the situation warrants.

It therefore appears that wherever schools employ dentists whose time is spent in part or wholly in making inspections, the same time could be more judiciously allotted to caring for the teeth of the dependent children.

The ideal place for a mouth inspection of a child is at the office of the family dentist. Here, a better examination may be made because of the availability of all necessary equipment for that purpose. Also, the parents have the fullest of confidence in the family dentist and the child stands an excellent chance of having any needed corrections made. The greatest advantage in having the child go to a private dental office for the inspection is that such a procedure is highly educational, assisting in developing a habit which will go much farther toward keeping the child's mouth healthy after he finishes school than hurried inspections made in the schoolroom.

The visit to the dentist is brought about by securing the cooperation of the classroom teacher. Each child is given a "notification" card and the teachers bend their efforts to obtain dental corrections and to present lessons in dental health.

The objections to the school dental clinic are as follows: 1. Its results are not educationally effective. The child having had free (and generally unappreciated) service during his stay in the grades passes on into high school and is not inclined to seek annual dental service at the hands of a private practitioner. 2. Because of the low salaries paid to school dentists, it is often difficult to

secure competent, conscientious dentists. Some dentists accept such positions in order to bridge a financial gap, often being uninterested and unprepared for the task at hand. 3. The average dental clinic employs the quantity production principle, with the result that extractions, cement fillings and other palliative forms of treatment represent the greatest part of the dental service rendered. In most instances, mouths are not made completely healthy; and the school insists on results, impressive figures. 4. In most cases, the facilities of school clinics are wholly inadequate for handling all the dependent or near dependent children. 5. Many persons that can afford to secure dental services for their children insist on having them cared for by the school clinic. As taxpayers, they cannot be refused. 6. Most school clinics offer dental service on a free basis. This policy leads to dependency on the part of many recipients and is contrary to well-established principles of family social service.

If the foregoing objections can be eliminated, either school dental services should be offered to all children alike regardless of the ability of their parents to pay or the school clinic be eliminated and relegated to the social service agencies of the community. In the meantime, all school systems that operate clinics will do well to remedy the existing evils and mitigate as far as possible the resultant dependency by insisting on a partial payment basis.

In the rural schools, it is felt that the Iowa dental plan has demonstrated results of a larger scope than has been attained elsewhere in the United States. During 1930-1931, the activity extended to rural schools of sixty-eight of our ninety-nine counties, while for 1931-1932, the total will be approximately eighty, as shown in the accompanying map. In most instances, the dental activity is conducted by the county superintendent of schools, but wherever there is a nurse, it is promoted by her. We have only sixteen full time and seven part time county nursing services. As a result, the work has been largely up to the superintendents, who have responded nobly. During the past year, 39,026 rural children "went to town" for dental services. This number represented 59.6 per cent of a group of 65,479 pupils in 4,299 rural schools. No report was received from 35,866 children in 2,358 schools. Our dental plan, therefore, has worked just as successfully for the rural schools as for the towns and cities, and this without the aid of dental inspections and traveling dental clinics. Data are given in the accompanying table.

The town and city report of 1930-1931 is not complete as yet, but 53.5 per cent of 95,540 pupils secured certificates signed by dentists. More than 400 schools ordered supplies for their dental programs last year. To date, we have yet to hear from an enrollment of 30,000 pupils. Like the rural communities, the urban centers are inadequately supplied with nursing services and the majority of the dental programs have been conducted with marked success under the direction of the superintendents of schools. The foregoing figures do not include a number of towns and cities which are using their own plans of operation, some with excellent results.

The Iowa dental plan has been successful not only in the rural schools and smaller towns, but also in some of the larger cities of the state, including Des Moines, a city of 150,000 population with 16,000 grade school children. This

1930-1931 RURAL SCHOOL DENTAL REPORT, BUREAU OF DENTAL HYGIENE, STATE UNIVERSITY OF IOWA

	1	2	3	4	5	6	7	8	9	10	11
	No. Pupils on Dental Honor Roll	Enrollment	Percentage of Corrections	No. Rural Schools	No. Rural Schools Reporting	Enrollment in Such Schools	Percentage of Corrections	No. 100% Schools	Percentage of 100% Schools (on Schools Active)	No. of Years Active	County Nurse
Adair	270	1244	21.7	106	56	892	30.2	5	7.26	2	None
Benton	518	1900	27.2	123	120	1850	28.0	1	.83	1	None
Black Hawk	252	1246	20.0	78	47	752*	33.5	4	8.51	1	None
Boone**	108	402	26.9	29	26	367	29.4	2	7.69	1	Part time
Bremer	707	1467	48.1	87	87	1467	48.1	15	17.20	4	None
Buchanan	206	1700	12.1	106	56	1005	20.4	3	5.34	2	None
Buena Vista	263	326	80.6	31	31	326	80.6	14	45.10	1	None
Calhoun	552	1245	44.3	92	75	1013	54.4	10	13.30	1	None
Cass	330	1400	23.5	115	68	900	36.6	7	1.02	2	Full time
Cedar	232	1257	18.4	78	41	656*	35.3	2	4.82	2	None
Cerro Gordo	500*	1769	28.2	110	80	800	62.5	0	0	4	None
Cherokee	401	856	46.8	75	64	737	54.4	8	12.50	2	None
Clarke	239	1100	21.7	86	33	379	63.0	3	9.09	2	None
Clay	330	960	34.3	75	55	715	46.1	6	10.90	1	None
Clayton	600	2145	27.9	153	70	911	65.8	6	8.57	2	None
Clinton	423	1525	27.7	112	80	1218	34.7	4	5.00	4	Full time
Crawford	641	2200	29.1	148	117	1480	43.3	5	4.27	2	None
Dallas	800	1495	53.5	94	50	1495#	53.5	1	2.00	2	None
Decatur	100	1800	5.5	103	24	400	25.0	1	4.16	1	None
Delaware	486	1280*	37.9	87	54	700*	69.4	2	3.51	4	Full time
Dickinson	193	487	39.6	32	26	390*	49.4	1	3.84	2	None
Emmet	134	1358	9.8	55	42	844	15.9	1	2.38	4	3 months
Floyd	429	1186	36.1	80	80#	1186#	36.1	5	6.25	2	None
Fremont	238	1091	21.8	69	36	620	37.4	3	8.33	1	None
Greene	16	1100	1.45	84	25	250	6.4	2	8.00	1	None
Grundy	195	1358	14.3	82	38	620	31.4	1	2.63	1	None
Hamilton	258	1500	17.2	105	63	997	25.8	0	0	1	None
Hancock	775*	1550	50.0*	107	96	1344*	57.6	11	1.14	1	3 months
Hardin	496	1640	30.2	101	81	1320	37.5	6	7.40	4	Full time
Harrison	1830	2392	76.5	121	121	2392	76.5	46	38.00	2	None
Henry	660	1163	56.7	69	69	1163	56.7	1	1.44	2	None
Iowa	544	1480	36.0	114	95	1140	47.7	4	4.21	2	None

Harrison	1830	2392	76.5	121	121	2392	76.5	46	38.00	2	None
Henry	660	1163	56.7	69	69	1163	56.7	1	1.44	2	None
Iowa	544	1480	36.0	114	95	1140	47.7	4	4.21	2	None
Jackson	583	1697	34.3	120	66	1084	53.7	11	16.60	2	None
Jasper	648	2712	23.0	153	103	1637	39.0	18	17.40	1	Full time
Jefferson	124	1200	10.3	84	35	500	40.3	.....	.....	2	None
Johnson	475	2200	21.5	130	80	1300	36.5	7	8.75	2	None
Jones	687	1454	47.2	100	82	1300	52.8	16	19.50	4	Full time
Linn	933	2442	38.2	136	118	2148	43.4	12	10.10	1	3 months
Lucas	0	1520	0	90	0	0	0	0	0	1	None
Lyon	347	1836	18.8	127	73	1146	30.2	6	8.21	2	Full time
Mahaska	41	1976*	2.07	112	8	120*	34.1	1	12.50	1	None
Marion	200	1582	12.6	105	20	300	66.6	0	0	2	None
Marshall	0	900	0	50	0	0	0	0	0	1	3 months
Mills	476	1427	33.2	71	64	1321	36.0	7	10.90	2	None
Mitchell	330	797	41.6	62	50	648	50.9	5	1.00	2	None
Monona	476	1327	35.8	98	84	1143	41.6	16	19.00	1	Full time
Montgomery	455	946	49.0	74	67	876	52.0	16	23.80	2	None
O'Brien	854	1223	69.8	96	94	1193	71.5	45	47.80	1	None
Osceola	379	1124	33.7	75	67	947	40.0	9	13.40	2	None
Page	695	1424	48.0	105	103	1394	49.0	12	1.16	4	None
Plymouth	656	2269	28.9	145	72	1059	61.9	13	1.80	2	Full time
Pocahontas	250	1250	20.0	92	67	871*	28.7	0	0	1	None
Polk	301	1430	21.0	67	57	1245	24.1	4	7.01	1	Full time
Pottawattamie	1082	3145	34.4	196	132	2107	51.3	25	18.90	1	None
Poweshiek	431	2300	18.7	113	51	510	84.5	8	15.60	1	None
Ringgold	225	1747	12.8	95	88	1584*	14.2	1	1.13	2	None
Sac	213	1407	15.1	94	29	435*	48.9	9	31.00	1	Full time
Scott	386	1901	19.6	97	65	1088	35.4	1	1.53	2	3 months
Tama	420*	1685	24.9	128	120	1560*	26.9	11	9.16	1	Full time
Union	185	950	19.4	80	47	530	34.9	4	8.29	1	None
Warren	232	1372	16.9	78	34	575*	40.3	2	5.88	1	None
Washington	676	1561	43.1	106	91	1366	49.4	13	14.20	1	Full time
Wayne	30	1186	2.5	84	5	62	48.3	2	40.00	1	None
Webster	791	1697	46.6	119	91	1334	59.2	8	8.79	4	Full time
Winnebago	342	1380	24.7	75	50	914	37.4	8	16.00	2	None
Winneshiek	615	1964	31.3	131	89	1391	44.2	13	14.60	2	None
Woodbury	462	1633	28.2	112	54	809	57.1	9	16.60	1	Full time
Wright	300	1959	15.3	120	37	653*	45.9	7	18.90	2	None
Totals	39,026	101,345	38.5	6657	4299	65,479	59.6	499	11.8		47 None Part time 15 Full time

Key: *Estimated. **One half county. #Not reported.

city has banished its school dental clinic as an undesirable instrument.

We avoid using the word "campaign" as applied to our dental education program as implying something temporary, while the word "program" suggests permanency. Permanency is what we desire. This can be accomplished only by formulating a program of education which will be acceptable to the educators. Most health literature available for school use is not educationally sound. It has been prepared by enthusiastic health workers who did not recognize the importance of correlation with the educator. We recognize the fact that while we have made progress in this direction, the surface has been but scratched in the development of a true program of dental health education. During the current year, we shall develop, through the college of education of the state university, a course of study in dental health education for the classroom teacher. (A questionnaire sent to all parts of the country indicates the drastic need for such material.) In the compilation of this work, there is no desire on our part to set dental health apart from general health. We agree that dental health education should be a part of general health education, but there is a definite need for a scientifically arranged handbook on dental health for teachers for their guidance in teaching the subject.

In the past, the bureau has furnished the teachers with bulletins, leaflets, posters, playlets, lantern slides, motion picture slides, etc. Many talks are given each year to pupils, teachers and parents, but we concentrate on the teacher as she is the important cog in the machinery for teaching dental health and securing dental corrections. If she cannot be interested, almost nothing can be accomplished. As a special inducement to the teacher and pupils, the bureau offers a certificate of award to all rooms that secure a complete return of cards signed by the dentists. Last year, aprpoximately 1,000 of these were issued.

In the promotion of the so-called Iowa plan, we have not adopted ironclad policies; we are ready to about face on any of them should we see that other roads are better. In many instances, we have adapted ourselves to the local conditions, trusting that, in the long run, it would be possible to bring about a desirable change.

CONCLUSION

We recognize the fact that what will work in Iowa may not be applicable to another state in some other part of the country. Perhaps conditions here are more favorable to the plan than elsewere; nevertheless, it is felt that many of the suggestions that we have set forth are fundamentally sound and usable almost anywhere in the United States. While the Iowa plan has not been in use a sufficient length of time to prove its permanency, for the limited amount of money and personnel that have been available it is felt that the results have been unusually successful. Our revised bulletin, No. 264, "The Iowa Plan for Dental Health Education," will be sent free on request.

1930-1931 RURAL SCHOOL DENTAL REPORT, BUREAU OF DENTAL HYGIENE, STATE UNIVERSITY OF IOWA

1930-1931 was a banner year in the rural department of Iowa's program of dental health education. Sixty-eight of our ninety-nine counties were engaged in the activity. In column 3 in the accompanying tabulation, the percentage of corrections is based upon the total enrollment regardless of whether counties reported any corrections; the gain was 13.5% over

last year. Column 7 shows the percentage of corrections for the enrollment of only schools that reported one or more names on the dental honor roll, 59.6%.

When evaluating the results of our program, consider among other factors the following: Of sixty-eight active counties, forty-seven have no nursing service whatever, six part time, and fifteen full time. No dental inspections are made except those of the school nurses in conjunction with the usual physical inspection and we have neither school nor traveling dental clinics for the rural communities—every pupil "going to town" for all dental services. These, however, with the exception of the nursing service, we do not consider handicaps. The success of the program is attributable to the county superintendents and nurses, in their ability to interest the teacher to interest the pupils. This is the key of success for any health program.

In addition to dental corrections reported for pupils, many teachers also secured them. In Harrison County, every rural teacher returned a signed certificate to the county superintendent. The teachers of Hardin, Monona, Montgomery, O'Brien, Osceola and Washington also secured many such corrections.

Thomas A. Gardner, D.D.S., *Director.*

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Occurrence of Fluorids in Some Water of the United States: H. V. Churchill, of the Aluminum Company of America, has studied the occurrence of fluorids in some waters of the United States. (*J. Ind. & Eng. Chem.*, September, 1931.) While expressing reserve that no causal connection has been established between the occurrence of fluorids in the water examined and the mottled enamel defect, the author has indicated that there may be a relationship between the content of fluorin and mottled enamel defect. Analytic results show that various samples of waters from endemic areas yielded the following results:

Location of Sample	Fluorin as Flourid P.p.m.
Deep Well, Bauxite, Ark.	13.7
Colorado Springs, Colo.	2.0
Well near Kidder, S. D.	12.0
Well near Lidgerwood, N. D.	11.0
Oakley, Idaho	6.0

"It is of interest to note," the author points out, "that apparently the relative severity of the defect in these various areas seems to follow the fluorid concentration."

A survey of some municipal supplies of water was undertaken, and the following table presented:

Distribution of Fluorids in Water

Present	Not Present
Cincinnati, Ohio	Philadelphia, Pa.
Milwaukee, Wis.	Washington, D. C.
Birmingham, Ala.	Albany, N. Y.
Pittsburgh, Pa.	Fairfield, Conn.
E. St. Louis, Ill.	New York, N. Y.
Kansas City, Mo.	Boston, Mass.
Toledo, Ohio	Newark, N. J.
Cleveland, Ohio	Chicago, Ill.
Detroit, Mich.	Dallas, Texas
Peoria, Ill.	Atlanta, Ga.
Indianapolis, Ind.	San Francisco, Calif.
Buffalo, N. Y.	Minneapolis, Minn.
Davenport, Iowa	Los Angeles, Calif.

Until a causal relation is established between certain concentrations of fluorin in water and the mottled enamel defect, the author points out that water chemists might well give attention to the problem of fluorid concentration in drinking water.

SAMUEL M. GORDON.

Production of Dental Caries in Rats Fed an Adequate Diet: In a study made on rats of the effect of diet on dental development, reported by Hoppert, Webber and Canniff, of the Department of Chemistry, Michigan State College (*Science*, July 17, 1931), caries was found in the normal control animals

that were receiving the stock ration employed in the laboratory, i. e., yellow corn, 60 parts, whole milk powder, 30, linseed meal, 6, alfalfa meal, 3, sodium chlorid, 1, which had given excellent results over a period of three and was believed to be adequate for normal dental development and maintenance. Rats on a high oatmeal, low calcium and low vitamin content gave no indications of caries, even though the dental structure was relatively soft. When oatmeal was substituted for cornmeal in the stock ration, caries failed to develop, the conclusion being that cornmeal was responsible for the decay of the teeth. In periodic examinations, it was observed that impaction of cornmeal particles usually occurred in the lower molars, followed by formation of a small cavity, which encouraged more extensive impaction and, in time, more extensive caries, in some cases going on to complete destruction of the tooth. The upper molars were rarely involved and then to a much less degree. The tendency of the cornmeal to become impacted increased with the size of the meal particle. Attempts to prevent decay of the teeth by the addition of cod-liver oil or orange juice, or by fortifying the ration with calcium carbonate or tricalcium phosphate, were of no avail. The authors believe that their results support a "not at all modern point of view"; namely, that the cause of dental decay is the decomposition, most likely by aciduric and acidogenic bacteria, of certain foodstuffs held by the teeth in some way. Those who have emphasized the importance of the diet from the standpoint of vitamins and minerals as a means of preventing or checking caries have, they believe, ignored the fact that in changing from a deficient to an adequate diet, there have no doubt been marked changes in the physical makeup of the food, resulting in a definite cleansing of the teeth. They add that it is also apparent from the results that a diet considered adequate merely from the chemical point of view is not necessarily a guarantee against dental decay.

Germicidal and Therapeutic Applications of Soaps: An investigation of this subject was undertaken by John E. Walker (*J. A. M. A.*, July 4, 1931), beginning the work with chemically pure compounds and continuing with a comparison of the effect of six representative soaps, the killing strengths for two and a half minutes at 20 c. being recorded and compared with that of phenol as a control germicide under the same experimental conditions. The results with commercial soaps agreed with the results anticipated from the knowledge of the chemically pure compounds. No one soap was found to have any particular germicidal value. That soap concentrations of from 1:80 to 1:1,280 destroyed bacteria is interesting when it is realized that the concentration of soap in an ordinary thick lather used in hand-washing is in the neighborhood of 1:12. The activity of soap was at least doubled in water of body temperature and enormously enhanced when hot water (45 C.) was used. The bacterial action is supplemented by the mechanical action. It was further found that the germicidal action of soap is greatly depressed by the presence of albuminous material such as serum, a property possessed by practically all germicides, mercurochrome-220 soluble not only ceasing to be a germicide when added to fresh defibrinated blood, but actually interfering with the germicidal action of the serum and the leukocytes. Soaps were strongly bactericidal against pneumococci, streptococci, meningococci, gonococci, diphtheria bacilli, influenza bacilli and *Spirochaeta pallida,* but did not destroy staphylococci and typhoid bacilli. The author quotes the work of Larson and Davison in showing that soaps have a definite effect in neutralizing bacterial toxins, and the work of Renaud, who has recently found a 2 per cent solution of sodium oleate beneficial in irrigation and in wet dressings for ulcerated surfaces.

The Influence of Soaps on the Germicidal Properties of Certain Mercurial Compounds: Conclusions: 1. Mercuric chloride is enormously increased in its germicidal action against virulent staphylococci at 37 C. by the addition of 1 per cent or more of soap. Small amounts of soap give irregular results and larger amounts have no more appreciable influence on the destruction of the bacteria than a 1 per cent solution. The time of exposure required to bring about the reaction is five minutes. This is true whether the cells are exposed first to the soap and then to the sublimate or vice versa. The addition of soap to strong concentrations of the germicide does not shorten the time interval necessary to complete sterilization. 2. The addition of soap to mercuric chloride does not enhance

the bactericidal action of the germicide when the following bacteria are used as test organisms: nonvirulent gram-positive cocci, *Bacillus coli, Bacillus typhosus, Bacillus paratyphosus* A, *Bacillus paratyphosus* B, *Bacillus dysenteriae* (Flexner), *Bacterium lactis-aerogenes, Bacterium acidi-lactici, Bacillus pyocyaneus* and *Micrococcus catarrhalis.* It can be shown, instead, that the soap acts as a protective agent for short intervals of exposure even when strong concentrations of the germicide are used. 3. Mercuric bromide and mercuric nitrate are likewise enhanced in germicidal activity against *Staphylococcus aureus* by the addition of soap. The other organisms tested show the same resistance as when corrosive sublimate is used. 4. Soap added to mercuric cyanide and o-chlormercuric phenol increases the disinfectant action of these compounds 3 or 5 times. There is no selective action for *Staphylococcus aureus* in these instances.—Bettylee Hampil, in *Am. J. Hyg.*, March, 1931.

Loss of Bone Salts During Scurvy: The probability that inorganic salts are of considerable importance in the diet was early suggested by Liebig. The classic studies of Forster, a pupil of Voit, placed this group of dietary components in the indispensable category, along with proteins and the vitamins, which were to be discovered much later. Today, there is no question of the necessity of the mineral salts in the diet; indeed, modern nutrition is characterized in part by the discovery of the physiologic rôle of unusual inorganic elements, often effective in exceedingly small amounts. Approximately 5 per cent of the body consists of mineral salts, a large part being calcium and phosphorous salts located in the bony structures. A study of the physiology of these salts is perforce associated with the growth and changes in osseous tissue. With the development of the conceptions of deficiency diseases and hormone stimulation, there gradually evolved more definite ideas of the etiology of certain abnormalities of the skeletal system. The relation of the pituitary to growth of bone, the shift of calcium and phosphorus under the influence of thyroid and parathyroid hormones, and the failure of normal calcification in the absence of vitamin D illustrate some of the relationships that have served to focus attention in recent years on the biochemistry of the inorganic salts. In the class of deficiency diseases involving the integrity of the bones is scurvy, one of the oldest known maladies. In addition to the more or less obvious hemorrhages that occur as the disease progresses is a failure of the normal deposition of calcium and phosphorus in the bones in spite of the fact that the diet may contain both these elements. A recent study of the replacement of the bone salts in healing scurvy has been made by Salter and Aub. An effort was made to determine whether or not the stores of lime salts in the bone were depleted at the same time that calcification of the growing portion was inhibited by lack of the antiscorbutic vitamin. At various stages of the disease in experimental animals, the missing vitamin C was supplied as orange juice and, at the same time, alizarin was injected so that newly deposited bone salts would be stained red and thus be easily detected. The Boston investigators found that in healing scurvy the epiphyseal line was especially well marked, indicating a deposition of salts in the zone of rapid calcification. Furthermore, the cancellous tissue of the epiphysis and diaphysis was stained, the pink trabeculae extending a short way into the medullary cavity. In addition, the shaft was colored by the dye distal to the epiphysis, though not so deeply as were the trabeculae. On the other hand, the bones of the animals receiving no source of vitamin C whatever remained unstained by the dye in spite of the fact that the experimental ration contained calcium and phosphorus. The fact that one of the signs of scurvy is a defective calcification of the bones has been well recognized. The demonstration that this derangement affects the storage of bone salts in the trabecular tissue as well as the deposition in the epiphysial region is a contribution of considerable importance. Normally, under certain circumstances, notably during lactation, there is a heavy drain on the maternal organism for calcium and phosphorus. Efforts to minimize this drain have thus far met with little success. The studies here discussed point to the fact that the utilization of the bone salts in times of stress may be favored by an abundance of the antiscorbutic vitamin.—*J. A. M. A.*, June 13, 1931.

MISCELLANY

BOOK REVIEWS

Paying Your Sickness Bills. By Michael M. Davis. 276 pages. Price $2.50. Published by the University of Chicago Press, Chicago, Illinois.

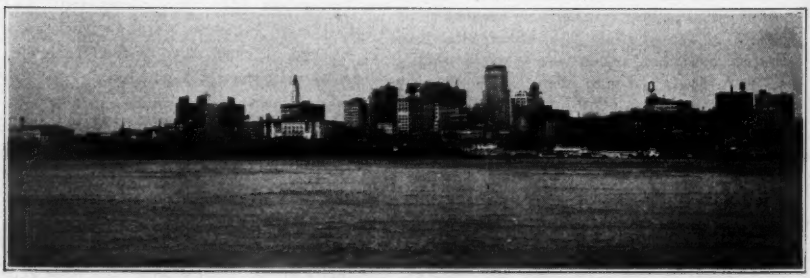
The first two sentences in the preface of this book give an insight into the motif of the volume. They are: "The costs of medical care are the subject of widespread complaint and of national investigation. This volume does not attempt to deal with the whole problem, but does wrestle with a portion of it."

And it may be said that the author wrestles with it in a most intelligent manner. What is said of the medical profession applies with almost equal emphasis to certain phases of the dental profession, though it must be recognized that the difference pointed out in the fees of medical men are probably greater than those of dentists. In the nature of things, this might be expected, because the best paid dentists seldom obtain fees of the magnitude of those of the best paid medical men.

This whole burning question of compensation for professional service is one of the acute problems of the day, and the best minds not only of those in the professions, but of the laity as well, are being directed toward a solution. One who has done as much as any one person in a study of this question is the author of the present volume, and we commend the book to a careful reading. Not that it will settle the question, not that it can be settled by anyone, because there is not at the present time sufficient understanding to enable us to evaluate the facts; but this book is a most illuminating attempt to throw concrete light on the subject and an honest effort to arrive at the truth.

One of the most interesting, and in some respects the most significant, chapters is that on "Fitting the bill to the purse." But there is meat for the medical practitioner in nearly every page of the book, and the professional man, be he physician or dentist, who studies the volume will receive enlightenment on the economic phase of his professional life.

Fractures of the Jaws. By Robert H. Ivy, M.D., D.D.S., F.A.C.S., Professor of Maxillo-Facial Surgery, Graduate School of Medicine, and of Clinical Maxillo-Facial Surgery, School of Dentistry, University of Pennsylvania; Chief of Maxillo-Facial Surgery, Graduate Hospital; Consultant in Plastic Surgery, Children's Hospital, Philadelphia; Colonel, Medical Officers Reserve Corps, U. S. Army, and Lawrence Curtis, A.B., M.D., D.D.S., Assistant Professor of Maxillo-Facial Surgery, Graduate School of Medicine, and School of Dentistry, University of Pennsylvania. Illustrated with 177 engravings. 180 pages. Price $4.50. Published by Lea & Febiger, Philadelphia.



Memphis Skyline.

The increasing literature of the profession is manifest when we consider that an entire volume is devoted to the subject of fractures. Not only this, but the book is in no sense padded. It is only an indication of the wider knowledge that has been gained on the subject, and the authors are to be congratulated on the comprehensive treatment that they have given their topic.

In some respects, the description of these cases is most detailed and special, but this does not indicate that they are too complicated to be understood by the general practitioner. Hospitalization is, of course, always most desirable, but in the practice of medicine or dentistry, we must be prepared for emergencies, and any dentist should be sufficiently informed to be able to handle any case temporarily and conserve the best interests of the patient till such time as the oral surgeon is available for the most expert service.

We commend this book as a most worthy addition to our dental literature.

From Six to Sixteen. By A. B. W. Suter, D.D.S. 20 pages. Illustrated. Price in quantities of 100 or more, $5.00 per hundred. Published by the John P. Smith Company, Inc., Rochester, N. Y.

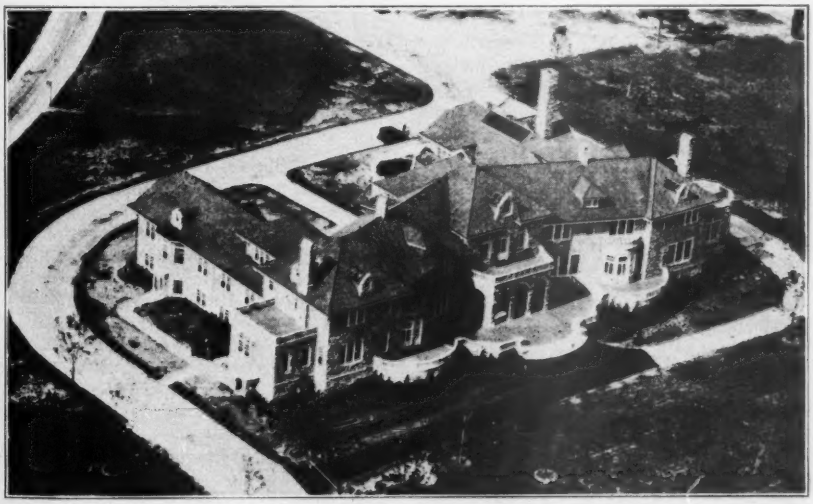
This little pamphlet is sponsored by Ritter Dental Manufacturing Company of Rochester, N. Y., and is issued by the John P. Smith Company, Inc., for use chiefly among the parents of children through the agency of dentists.

It embodies a clear and useful description of the teeth of the child, and such instruction as is most needed during that important period from 6 to 16. It is clothed in language that is understandable by all, and the aggregate of good that may result from a wide distribution is beyond estimate. We would advise every dentist to procure a copy of this book, and we feel sure that he will want to distribute it among news patients.

Deaths

Gardiner, J. C., Evanston, Ill.; Northwestern University Dental School, 1896; died, August 29, of heart disease; aged 77.

Needle, Mortimer W., New York City; New York University College of Dentistry, 1919; died, June 9.



The Pink Palace—Memphis Museum of Natural History.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Dental Association, Memphis, Tenn., Oct. 19-23, 1931.

American Academy of Periodontology, Memphis, Tenn., Oct. 15-17, 1931.

Association of American Women Dentists, Memphis, Tenn., Oct. 19, 1931.

American Dental Hygienists' Association, Memphis, Tenn., Oct. 19-23, 1931.

American Dental Assistants Association, Memphis, Tenn., Oct. 19-23, 1931.

American Full Denture Society, Memphis, Tenn., Oct. 16-17, 1931.

American Society of Oral Surgeons and Exodontists, Memphis, Tenn., Oct. 16-17, 1931.

American Society for the Promotion of Children's Dentistry, Memphis, Tenn., Oct. 19, 1931.

American Academy of Restorative Dentistry, Memphis, Tenn., Oct. 18, 1931.

National Board of Dental Examiners, Memphis, Tenn., Oct. 23, 1931.

Chicago Dental Society, January 18-21.

Greater New York, New York City, November 30-December 4.

Kings County Dental Society of Brooklyn, N. Y., February 25-27.

Montreal Dental Club, October 15-17.

National Association of Dental Examiners, Memphis, Tenn., October 17.

New England Dental Society, Boston, Mass., October 8-10.

New York Society of Oral Surgeons, October 26.

Odontological Society of Western Pennsylvania, Pittsburgh, November 18-20.

Society for Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

Southern Society of Orthodontists, Cincinnati, Ohio, December 1-3.

Southwestern Dental Society, Albuquerque, N. M., October 13-15.

St. Louis (Mo.) Dental Society, December 7-9.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

October

New Mexico, at Albuquerque (13-15).

December

Ohio, at Cincinnati (1-3).

February

Minnesota (24-26).

April

Michigan, at Detroit (11-13).

May

New York, at Albany (11-13).

STATE BOARDS OF DENTAL EXAMINERS

California, at San Francisco, December 14. Bert Boyd, Secretary, 610 South Broadway, Los Angeles.

Colorado, at Denver, December 1. Zenas T. Roberts, Secretary, 810 Metropolitan Bldg., Denver.

Connecticut, at Hartford, November 16-19. Almond J. Cutting, Recorder, Southington.

Indiana, at Indianapolis, November 16-19. J. M. Hale, Secretary, Mt. Vernon.

New Jersey, at Trenton, December 7-12. John C. Forsyth, Secretary, 148 W. State St., Trenton.

Rhode Island, at Providence, December 1-3. Albert L. Midgley, Secretary, 1108 Union Trust Bldg., Providence.

Wisconsin, at Milwaukee, December 14-18. S. F. Donovan, Secretary, Tomah.

---

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

OHIO STATE DENTAL SOCIETY

The sixty-sixth annual meeting of the Ohio State Dental Society will be held at Cincinnati, December 1-3, in conjunction with a meeting of the Southern Society of Orthodontists. There will be class reunions of Ohio State University Dental School (D. P. Snyder, Columbus, Chairman); Western Reserve Dental School (S. F. Hitsch, Cleveland, Chairman); Ohio College of Dental Surgery (H. C. Matlack, Cincinnati, Chairman), and Cincinnati Dental College (R. B. Stevens, Cincinnati, Chairman). Graduates of these schools are urged to get in touch with their respective chairmen for reservations.

EDWARD J. ROCHE, *Chairman*
Publicity Committee,
453 Doctors Bldg., Cincinnati.

COLORADO BOARD OF DENTAL EXAMINERS

The Colorado State Board of Dental Examiners will meet at 1340 Arapahoe St., Denver, December 1, at 8 a. m., for the purpose of conducting the regular semi-annual examination of all applicants for a license to practice dentistry in Colorado. Applications should be in the hands of the secretary not less than one week previous to this date. For further information, address

ZENAS T. ROBERTS, *Secretary,*
810 Metropolitan Bldg., Denver.

CONNECTICUT DENTAL COMMISSION

The Connecticut Dental Commission will meet in Hartford, November 16-19, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

ALMOND J. CUTTING, *Recorder,*
Southington.

REHWINKEL DENTAL SOCIETY

The Rehwinkel Dental Society will hold its twenty-first annual fall meeting at the Masonic Temple, Chillicothe, Ohio, October 15, with all day and evening sessions.

WILLIAM G. HAMM, *Secretary,*
19 S. Paint St., Chillicothe.

ASSOCIATION OF AMERICAN WOMEN DENTISTS

The tenth annual meeting of the Association of American Women Dentists will be held at the Peabody Hotel, Memphis, Tenn., Room 214, Monday, October 19. Registration, 9 a. m. to 12 m.; business meeting, 2:30 p. m.; banquet, 6:30 p. m. The banquet will terminate in time to attend the entertainment to be given by the American Dental Association at 10:00 p. m.

GLADYS GRIFFIS, *Secretary,*
303 First National Bank Bldg.,
Paris, Texas.

AMERICAN ACADEMY OF PERIODONTOLOGY

The eighteenth annual meeting of the American Academy of Periodontology will convene at the Hotel Gayoso, Memphis, Tenn., October 15-17.

CLAYTON H. GRACEY, *Secretary,*
Fisher Bldg., Detroit, Mich.

RHODE ISLAND BOARD OF REGISTRATION IN DENTISTRY

A meeting of the Rhode Island Board of Registration in Dentistry for the examination of applicants for license to practice dentistry and dental hygiene will be held at the State House, Providence, December 1-3, beginning each day at 9 a. m. Candidates shall present to the secretary of this board at least one week before the examination an application with fee and photograph. For applications and further information, address

ALBERT L. MIDGLEY, *Secretary,*
1108 Union Trust Bldg., Providence.

NATIONAL BOARD OF DENTAL EXAMINERS

The annual meeting of the National Board of Dental Examiners will be held October 23, at 9 a. m. in the Peabody Hotel, Memphis, Tenn., at which time officers for the ensuing year will be elected.

HARRY W. NELSON, *Temporary Secretary,*
1747 Medical Arts Bldg.,
Minneapolis, Minn.

MINNESOTA STATE DENTAL ASSOCIATION

The forty-ninth annual meeting of the Minnesota State Dental Association will be held at the new Municipal Auditorium, St. Paul, February 24-26. All members of the American Dental Association or recognized foreign dental organizations are invited.

L. M. CRUTTENDEN, *Secretary,*
435 Hamm Bldg., St. Paul.

NEW YORK SOCIETY OF ORAL SURGEONS

The New York Society of Oral Surgeons will hold its first meeting of the year 1931-1932 at the Academy of Medicine, 103d St. and Fifth Ave., New York City, October 26, at 8:30 p. m. All oral surgeons and exodontists of New York State are invited to attend.

S. BERTON GERSTNER, *Secretary,*
529 Courtlandt Ave., New York City.

GREATER NEW YORK DECEMBER MEETING FOR BETTER DENTISTRY

The seventh Greater New York December Meeting for Better Dentistry will be held at the Hotel Pennsylvania, New York City, November 30-December 4.

The sessions will open at 2 p. m. with a joint meeting of physicians and dentists, which will continue through Monday afternoon and evening. The subjects to be covered are: (1) Relation of Nose, Throat and Ear Diseases to Oral Diseases; (2) Relation of Obstetrics and Pediatrics to Dental Diseases, and (3) Relation of Internal Medicine to Oral Diseases.

Beginning Tuesday morning, admission will be by card only.

JOHN T. HANKS, *Chairman.*

SEVENTH ANNUAL FALL CLINIC OF THE MONTREAL DENTAL CLUB

The Seventh Annual Fall Clinic of the Montreal Dental Club will be held at the Windsor Hotel, October 15-17. All ethical dentists are invited to attend. Fee, including two luncheons, $15. Forward registration to Campbell Morris, 305 Birks Bldg., Montreal.

ERWIN C. BURBANK,
1008 Medical Arts Bldg.

BALTIMORE COLLEGE OF DENTAL SURGERY DENTAL SCHOOL ALUMNI OF NEW JERSEY

The Baltimore College of Dental Surgery Dental School Alumni of New Jersey will hold a reunion and banquet, November 10, at the Elks Club, Newark.

BERNARD KNIBERG, *Secretary,*
138 Clinton Ave., Newark.

ST. LOUIS STUDY CLUB OF DENTISTRY

The fourteenth annual session of the St. Louis Study Club will begin Wednesday, October 14, and continue every second Wednesday thereafter, those too near the holidays being eliminated. Classes will be presented in dental roentgenology, crown and inlay casting technic, tooth form, cavity preparation and ceramics, conductive and local anesthesia, oral diagnosis and diseases of the mouth, oral bacteriology, dental economics, cast partial dentures, anatomy of the head and public speaking (special course). The St. Louis Study Club of Dentistry Bulletin will be ready for distribution October 1.

D. C. BERNHARDT, *President.*

PSI OMEGA FRATERNITY NATIONAL ALUMNI CHAPTER

The headquarters of the National Alumni Chapter of the Psi Omega Fraternity will be at the Claridge Hotel. The annual banquet will be held, October 19, at 6:30, at the Claridge. The executive meeting together with initations will be held at headquarters, October 20, at 2 p. m.

J. R. MITCHELL, *Secretary,*
Candler Bldg.,
Atlanta, Ga.

DELTA SIGMA DELTA FRATERNITY

The forty-seventh annual meeting of the Supreme Chapter of Delta Sigma Delta will be held October 19, beginning at 9:30 a. m. Luncheon will be followed by a business meeting and initiatory exercise. The annual banquet will be held at Hotel Gayoso, headquarters, at 6 p. m. Present membership card when registering for banquet. If planning to

attend, address Brother Justin D. Towner, Exchange Bldg., Memphis, Tenn.

By Order of the Supreme Council.

XI PSI PHI FRATERNITY

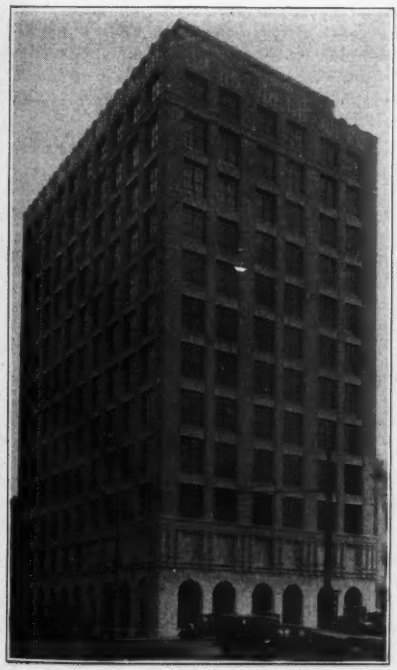
The Supreme Chapter of Xi Psi Phi Fraternity will hold its biennial meeting, October 16-17, at the Elks Hotel, beginning October 16, at 9 a. m. The banquet will be held at the Elks Hotel, October 19 at 6:30 p. m.

G. A. GRUBB, *Supreme President,*
Lincoln, Nebr.

ALPHA OMEGA FRATERNITY

A meeting of the Supreme Council has been called by the order of the Supreme Chancellor, Monday, October 19, at 2 p. m., at the Hotel Chisca, fraternity headquarters. All fraters are requested to attend this meeting. The chairman of local arrangements is M. H. Davis, Hotel Peabody, Memphis.

A. M. FLASCHNER, *Supreme Scribe,*
419 Boylston St.,
Boston, Mass.



Cotton Exchange Bldg.

Farnsworth Building.

RAILROAD RATES TO MEMPHIS, TENN.

The American Dental Association has discontinued the use of the Identification Convention Certificate, and again this year is using the "Certificate Plan." The certificates will be obtainable from your railroad agent, and NOT THROUGH THIS OFFICE. Following is full information regarding the plan, and giving dates of sale of tickets in all sections of the United States.

The following directions are submitted for your guidance:

1. Be sure that when purchasing going ticket you request a CERTIFICATE. *Do not make the mistake of asking for a "Receipt."*

2. Present yourself at the railroad station for tickets and Certificates at least 30 minutes before departure of train on which you will begin your journey.

3. *Certificates are not kept at all stations.* If you inquire at your home station, you can ascertain whether Certificates and through tickets can be obtained to place of meeting. If not obtainable at your home station, the agent will inform you at what station they can be obtained. You can in such case purchase a local ticket to the station which has Certificates in stock, where you can purchase a through ticket and at the same time ask for and obtain a Certificate to place of meeting.

4. *Immediately on your arrival at the meeting present your Certificate* to the endorsing officer, Dr. Max Giesecke, Vice-President, as the reduced fares for the return journey will not apply unless you are properly identified as provided for by the Certificates.

5. *It has been arranged that the Special Agent of the Carriers will be in attendance on October 19 to 23 from 8:30 a. m. to 5:30 p. m., to validate Certificates.* If you arrive at the meeting and leave for home again prior to the Special Agent's arrival, or if you arrive at the meeting later than October 23, after the Special Agent has left, you cannot have your Certificate validated and consequently you will not obtain the benefit of the reduction on the home journey.

6. Certificates issued to children at half fares will be counted the same as Certificates held by adults.

7. If your Certificate is duly validated, you will be entitled up to and including October 27 to a return ticket via the same route over which you made the going journey *at one-half of the regular one-way tariff fare* from the place of meeting to the point at which your Certificate was issued. *(The identical route must be used in both going and returning in order to benefit under the Certificate plan.)*

8. Return tickets issued at the reduced fares will not be good on any limited train on which such reduced fare transportation is not honored.

9. *No refund of fare will be made on account of failure to obtain proper Certificate when purchasing going tickets, nor on account of failure to present validated Certificate when purchasing return ticket.*

A program of exceptional merit has been arranged, and we extend to you a cordial invitation to be present.

Transportation Committee

O. J. SPECKER,
R. L. SPRAU,
HARRY W. NELSON,
W. F. NORTHRUP,
H. B. PINNEY, *Chairman,*
212 East Superior Street, Chicago, Ill.

TRUNK LINE ASSOCIATION

Sale dates for New York State (east of Buffalo and Salamanca), New Jersey, Pennsylvania (east of Erie, Oil City and Pittsburgh), Delaware, Maryland, District of Columbia, Virginia and West Virginia (east of Wheeling, Parkersburg, Kenova) ..... Oct. 13-19, Incl.
Final honoring date ..... Oct. 27, 1931

TRANS-CONTINENTAL PASSENGER ASSOCIATION
WESTERN PASSENGER ASSOCIATION

Sale dates for Colorado (Julesburg only), Illinois, Iowa, Kansas, Manitoba (see note), Minnesota, Missouri, Nebraska, Northern Michigan, North Dakota, South Dakota, Wisconsin.....Oct. 13-19, Incl.
Colorado (except Julesburg), New Mexico, Wyoming.....Oct. 12-18, Incl.
Arizona, British Columbia, Idaho, Montana, Nevada, Utah, Oregon (except via California), Washington.....Oct. 11-17, Incl.
California.....Oct. 10-17, Incl.
Oregon (via California).....Oct. 9-16, Incl.

NOTE—Manitoba (on Great Nor., Nor. Pac. and M., St. P. & S. S. M. Rys., also from Winnipeg via Can. Nat'l and Can. Pac. Rys.)

Final honoring date.....Oct. 27, 1931

SOUTHEASTERN PASSENGER ASSOCIATION

Sale dates for points in territory (south of the Ohio and Potomac and east of the Mississippi Rivers).....Oct. 13-19, Incl.
Final honoring date.....Oct. 27, 1931

NEW ENGLAND PASSENGER ASSOCIATION

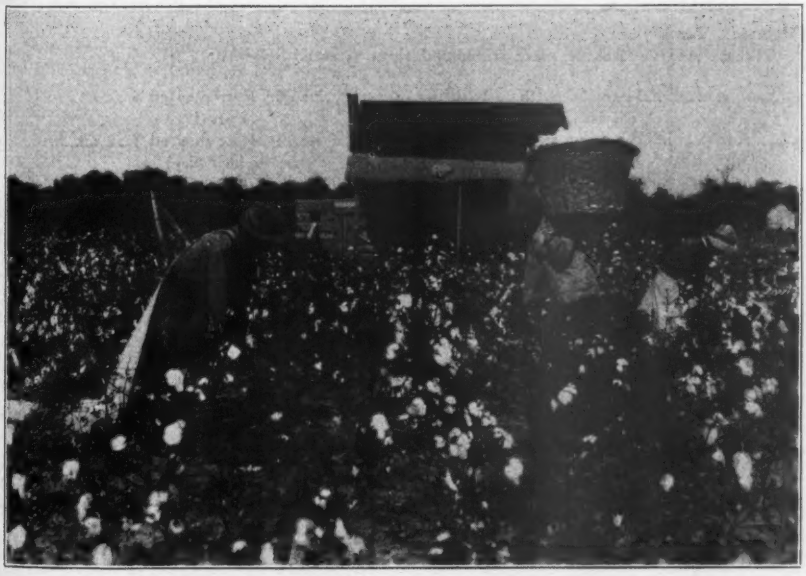
Sale dates for points in territory (New England).....Oct. 13-19, Incl.
Final honoring date.....Oct. 27, 1931

SOUTHWESTERN PASSENGER ASSOCIATION

Sale dates for Oklahoma, Texas.....Oct. 12-18, Incl.
Arkansas, Kansas, Louisiana, Missouri, Memphis, Tennessee, and Natchez, Miss.....Oct. 13-19, Incl.
Final honoring date.....Oct. 27, 1931

CENTRAL PASSENGER ASSOCIATION

Sale dates for points in territory (west of Buffalo, Niagara Falls, Salamanca, Pittsburgh, Wheeling, Parkersburg, and Kenova to and including Chicago and St. Louis, and north of the Ohio River, including Cincinnati, Louisville and Cairo).....Oct. 13-19, Incl.
Final honoring date.....Oct. 27, 1931



Cotton fields near Memphis, Tenn.

AMERICAN DENTAL ASSOCIATION

Memphis, Tennessee. October 19-23, 1931.

HOTEL RESERVATION

In securing hotel reservations for the 1931 Session, consult the hotel rate-sheet and fill out the blank application below. Mail immediately to the hotel you wish to patronize. The hotel will then advise you of the reservation which has been made for you.

As your first choice may not be available, kindly indicate a second and a third choice. If none of these are available, the hotel manager will mail your application to the Chairman of Halls and Hotels Committee, who will make a reservation for you in as favorable a hotel as possible.

Please remember that a reservation constitutes a contract with the hotel to provide you with the accommodations you desire. If you find it impossible to carry out your part of the contract, namely, to occupy the room at the time agreed on, please write or wire the hotel, releasing it, in order that your room may be available for other members.

MAIL THIS APPLICATION DIRECT TO THE HOTEL

HOTEL RESERVATION

AMERICAN DENTAL ASSOCIATION, MEMPHIS, TENNESSEE, OCTOBER 19-23, 1931

.....Hotel. .....1931.

Memphis, Tenn.

Please reserve sleeping room accommodations as noted below:

.....Room (s) with bath for.....people. Rate desired $..... (per day)

.....Room (s) without bath for.....people. Rate desired $..... (per day)

Second choice hotel.....

Third choice hotel.....

ROOMS TO BE OCCUPIED BY: ADDRESS IN FULL

Applicant..... .....

....

....

Please confirm this reservation to applicant. I further agree to notify the hotel at once in the event I am unable to use this reservation.

IMPORTANT TO HOTEL MANAGER: In the event you cannot accept this reservation, please forward this application at once to Dr. E. F. Simpson, Chairman Halls and Hotels Committee, 735 Sterick Bldg., Memphis, Tenn., who will attend to the assignment of this reservation.

HOTEL	Single Room with Bath	Double Room with Bath	Single Room without Bath	Double Room without Bath
ADLER 73 Linden Ave.	$2.00 & up	$3.50 & up 5.00 & up (twin beds)	$1.50 & up	$2.50 & up
AMBASSADOR 347 S. Main	2.00	3.50	1.50	2.50
CATHOLIC CLUB 185 Adams			1.25	2.00
CHICKASAW 99 S. Main			1.00	1.50
CHISCA 270 S. Main	2.00 & up	4.50 & up 5.00 & up (twin beds)	2.00 & up	3.50 & up
CLARIDGE 109 N. Main	3.00 & up	4.50 & up		
DESOTO 154 E. Calhoun			1.25	2.00
ELK'S 69 Jefferson	3.00-3.50	4.00-5.00 5.00-6.00 (twin beds)	2.00-2.50 Con. bath	3.00-4.00 Con. bath
FOREST PARK 855 Union	2.00	2.50	1.00-1.50	1.50-2.00
GAYOSO 139 S. Main	3.00 & up	5.00 & up	2.00 & up	3.00 & up
HERMITAGE APTS. 200 Union	1.50	2.75	1.00	1.75
WM. LEN 110 Monroe Ave.	2.50 & up	4.50 5.00 (twin beds)		
LONGINOTTI S. Main St.			1.00	1.50
PARKVIEW 1914 Poplar	3.50	5.00-6.00		
PEABODY HOTEL 149 Union	3.50 & up	5.50 & up 7.00 & up (twin beds)		
PLAZA 214 Calhoun	2.00	3.00	1.50-2.00	2.50-3.00
POLK APTS. 630 Madison	2.00	2.50-3.00		
PONTOTOC 69 Pontotoc	1.50	2.00	1.00	1.50
TENNESSEE 80 S. Third St.	2.00 & up	3.00 & up		
WINONA 110 E. Calhoun	2.00	3.00	1.00-1.50	2.00-3.00
WALDORF S. Main St.	1.50	2.00	1.00	1.50

RECENT BOOKS WORTH BORROWING* OR BUYING†

from the

LIBRARY BUREAU

of the

AMERICAN DENTAL ASSOCIATION

212 E. Superior St., Chicago, Ill.

American Pharmaceutical Assn.	Pharmaceutical recipe book. Baltimore, Md., American Pharmaceutical Assn., 1929. $5.00.
Anderson, G. M.	Orthodontic laboratory manual. St. Louis, Mosby, 1930. $2.00.
Anthony, L. P.	Dental terminology. Chicago, American Dental Assn., 1930. (Free.)
Appleton, J. L. T., Jr.	Bacterial infection with special reference to dental practice. Philadelphia, Lea & Febiger, 1925. $6.00.
Appleton, J. L. T., Jr., & Bryant, C. K.	Laboratory guide in bacteriology. Philadelphia, Lea & Febiger, 1928. $2.75.
Bartels, H. A.	Outline of bacteriology. New York, W. A. Broder, 1929. $2.00.
Berger, Adolph	Principles and technique of oral surgery. Brooklyn, Dental Items of Interest Pub. Co., 1927. $7.00.
Berger, Adolph	Principles and technique of the removal of teeth. Brooklyn, Dental Items of Interest Pub. Co., 1929. $7.50.
Blunt, Katharine, & Cowan, Ruth	Ultraviolet light and vitamin D in nutrition. Chicago, University of Chicago Press, 1930. $2.50.
Bodecker, C. F.	Elementary histology for dental hygienists. New York, W. A. Broder, 1929. $2.00.
Box, H. K.	Necrotic gingivitis. Toronto, University of Toronto Press, 1930. (Pamphlet) $1.00.
Box, H. K.	Treatment of the periodontal pocket. Toronto, University of Toronto Press, 1928. (Pamphlet) $1.00.
Bregstein, S. J.	Business conduct of an ethical practice. Brooklyn, Dental Items of Interest Pub. Co., 1929. $4.00.
Broderick, F. W.	Dental medicine. St. Louis, Mosby, 1928. $6.00.
Broderick, F. W.	Dental bacteriology. Outlines of dental science. Vol. 2. Edinburgh, Livingstone, 1926. $2.50.
Brothers, E. D.	Dental jurisprudence. St. Louis, Mosby, 1928. $2.25.
Brown, A. J.	Dental metallurgy. Outlines of dental science. Vol. 11. New York, Wood, 1928. $2.50.
Brown, W. L.	Endocrines in general medicine. St. Louis, Mosby, 1927. $3.00.
Buckley, J. P.	Modern dental materia medica, pharmacology and therapeutics. Philadelphia, Blakiston, 1926. $6.00.
Bulleid, Arthur	Textbook of bacteriology for dental students. St. Louis, Mosby, 1927. $4.50.
Bunce, E. W.	Bunce-Kanouse full denture technic. Chicago, Coe Laboratories, Inc., 1929. $1.00.

*Books may be *borrowed* by members of the Association for a period of one week after date of receipt; and if not reserved for some one else, the period will be extended on request. A deposit of $2.00 for each volume to be sent at one time should accompany all requests for books. This will be refunded on return of books.

†If you wish to *purchase* books, indicate plainly which books you desire and enclose check with order.

Bunting, R. W.	A textbook of oral pathology for students and practitioners of dentistry. Philadelphia, Lea & Febiger, 1929. $7.00.
Burchard, H. H., & Inglis, O. E.	Textbook of dental pathology and therapeutics for students and practitioners. Philadelphia, Lea & Febiger, 1926. $7.50.
Burkhart, H. J.	Care of the mouth and teeth. (National Health Series.) New York, Funk & Wagnalls, 1928. $.30.
Buxton, J. L. D.	Dental pathology. Outlines of dental science. Vol. 7. New York, Wood, 1927. $2.50.
Buxton, J. L. D.	Dental surgery. Outlines of dental science. Vol. 8. New York, Wood, 1927. $2.50.
Cahn, L. R.	Basic principles of general and oral pathology. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1929. $4.50.
Campbell, J. M.	Those teeth of yours. London, Heinemann, 1929. $1.00.
Cattell, Psyche	Dentition as a measure of maturity. Cambridge, Harvard University Press, 1928. $1.00.
Clark, C. A.	Dental radiography. Outlines of dental science. Vol. 5. New York, Wood, 1926. $2.50.
Colyer, Stanley	Chronic infection of the jaws: a short radiological and clinical study. New York, Macmillan, 1926. $3.50.
Daukes, S. H.	Medical museum: Modern developments, organization and technical methods based on a new system of visual teaching. London, Wellcome Foundation, Ltd., n.d. (No purchase orders accepted.)
Davis, M. M.	Paying your sickness bills. Chicago, University of Chicago Press, 1931. $2.50.
Dental Board of the United Kingdom	Four lectures on "general anaesthesia." London, Dental Board of the United Kingdom, 1926. $1.25.
Dental Board of the United Kingdom	Three lectures on "dental alloys." Delivered under the auspices of the Dental Board of the United Kingdom. London, Dental Board of the United Kingdom, 1927. $1.25.
Diamond, M.	Dental anatomy. A graphic presentation of tooth forms with an original technique for their reproduction. New York, Macmillan, 1929. $5.00.
Doxtater, L. W.	Procedures in modern crown and bridge-work. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1931. $8.00.
Endleman, Julio	Special dental pathology; a treatise for students and practitioners. St. Louis, Mosby, 1927. $7.00.
Ennis, L. M.	Dental roentgenology. Philadelphia, Lea & Febiger, 1931. $6.50.
Federspiel, M. N.	Harelip and cleft palate. St. Louis, Mosby, 1927. $5.00.
Feldman, M. H.	Manual of exodontia. Philadelphia, Lea & Febiger, 1930. $3.50.
Fones, A. C.	Mouth hygiene; a textbook for dental hygienists. Philadelphia, Lea & Febiger, 1927. $5.00.
Fones, A. C.	Preventive dentistry. Philadelphia, Lea & Febiger, 1925. $2.75.
Foote, J. S.	Bone as a measure of development: When and how we acquired our teeth. Chicago, American Dental Association, 1928. $4.00.
Franzen, Raymond	Public health aspects of dental decay in children. New York, American Child Health Assn., 1930. $1.25.
Gies, W. J.	Dental education in the United States and Canada. New York, Carnegie Foundation, 1926. (Free.)
Goepp, R. M.	Dental state board questions and answers. Philadelphia, Saunders, 1928. $4.50.
Goslee, H. J.	Principles and practice of crown and bridge-work. Brooklyn, Dental Items of Interest Pub. Co., 1926. $7.50.
Greenfield, A. L.	Interpretation of dental radiograms. Rochester, N. Y., Ritter Dental Mfg. Co., 1926. $2.50.
Gregory, W. K.	Our face from fish to man. New York, Putnam, 1929. $4.50.

Gwathmey, J. T.	Textbook of anesthesia. New York, Macmillan, 1929. $7.50.
Gwinn, C. D.	Textbook of exodontia. Philadelphia, Lea & Febiger, 1927. $2.75.
Gysi, Alfred	Special teeth for cross-bite cases. New York, Dentists' Supply Co., 1928. (Pamphlet.) (No purchase orders accepted.)
Hackh, I. W. D.	Chemical reactions and their equations. Philadelphia, Blakiston, 1928. $2.00.
Haden, R. L.	Dental infection and systemic disease. Philadelphia, Lea & Febiger, 1928. $2.50.
Hanau, R. L.	Dental engineering. Buffalo, N. Y., Author, 1926. (No purchase orders accepted.)
Hanau, R. L.	Hanau intraoral method vs. Gysi extraoral method. Buffalo, N. Y., Author, 1927. (No purchase orders accepted.)
Hartman, L. L.	Teeth and the mouth. New York, Appleton, 1927. $1.50.
Head, Joseph	Everyday mouth hygiene. Philadelphia, Saunders, 1925. $1.00.
Hedstrom, Gustav	Gangrene of dental pulp and its treatment. Stockholm, Sweden, Isaac Marcus, 1927. (No purchase orders accepted.)
Headridge, Davis, & Gibson, S. K.	Dental anatomy, human and comparative. Outlines of dental science. Vol. 6. New York, Wood, 1928. $2.50.
Herbst, Emil, & Apffelstaedt, Max	Atlas and grundriss der missbildungen der kiefer and zähne. München, J. F. Lehmanns, 1928. (No purchase orders accepted.)
Hertzler, E.	Technic of local anesthesia. St. Louis, Mosby, 1925. $5.50.
Hess, Walter, & Zurcher, Ernst	Anatomy of the root-canals of the teeth. New York, Wood, 1925. $5.50.
Hogeboom, F. E.	Practical pedodontia or juvenile operative dentistry and public health dentistry. St. Louis, Mosby, 1927. $3.50.
Hyatt, T. P.	Hygiene of mouth and teeth. Brooklyn, N. Y., Brooklyn Dental Pub. Co., 1929. $1.00.
Ivy, R. H., & Curtis, Lawrence	Fractures of the jaws. Philadelphia, Lea & Febiger, 1931. $4.50.
Jamieson, J. D. H.	Operative dentistry. Outlines of dental science. Vol. 9. New York, Wood, 1927. $2.50.
Jerman, E. C.	Modern x-ray technic. St. Paul, Bruce Pub. Co., 1928. $5.50.
Jordan, M. Evangeline	Operative dentistry for children. Brooklyn, Dental Items of Interest Pub. Co., 1927. $5.00.
Kanner, Leo	Folklore of the teeth. New York, Macmillan, 1928. $4.00.
Kells, C. E.	Dentists' own book, including a complete bookkeeping and recording system. St. Louis, Mosby, 1925. $7.50.
Kells, C. E.	Three score years and nine. New Orleans, The Author, 1926. $8.00.
Kennedy, Edward	Partial denture construction. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1928. $7.50.
Kent, E. N.	Business side of dentistry. St. Louis, Mosby, 1929. $5.00.
LeGro, A. L.	Ceramics in dentistry. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1926. $7.50.
Leriche, R., & Policard, A.	Normal and pathological physiology of bone. St. Louis, Mosby, 1928. $5.00.
Livingston, Alexander	Dental histology. Outlines of dental science. Vol. 10. New York, Wood, 1928. $2.50.
Logan, J. D.	Dental prosthetics. Outline of dental science. Vol. 4. Edinburgh, Livingstone, 1926. $2.50.
Lloyd-Williams, E.	Dental mechanics: a manual for students and junior practitioners. London, Bale, 1931. $2.00.
Marriott, W. M.	Infant nutrition: a textbook of infant feeding for students and practitioners of medicine. St. Louis, Mosby, 1930. $5.50.
Marsden, P. H.	Dental materia medica. Outlines of dental science. Vol. 3. Edinburgh, Livingstone, 1926. $2.50.

Maximow, A. A., & Bloom, Wm.	Textbook of histology. Philadelphia, Saunders, 1930. $9.00.
McCollum, E. V., & Simmonds, Nina	Food, nutrition and health. Baltimore, Authors, 1928. $1.50.
McCollum, E. V., & Simmonds, Nina	Newer knowledge of nutrition. New York, Macmillan, 1929. $5.00.
McCoy, J. D.	Applied orthodontia. Philadelphia, Lea & Febiger, 1931. $4.50.
McCaw, Emma J.	Dental assistant. St. Louis, Mosby, 1926. $1.50.
McGehee, W. H. O.	Textbook of operative dentistry. Philadelphia, Blakiston, 1930. $10.00.
Marshall, J. A.	Diseases of the teeth; their diagnosis and treatment. Philadelphia, Lea & Febiger, 1926. $4.50.
Mead, S. V.	Diseases of the mouth. St. Louis, Mosby, 1928. $10.00.
Mellanby, May	Diet and the teeth: an experimental study. Part I. Dental structure in dogs. London, His Majesty's Stationery Office, 1929. $7.00.
Mellanby, May	Diet and the teeth: an experimental study. Part II. A. Diet and dental disease. B. Diet and dental structure in mammals other than the dog. London, His Majesty's Stationery Office, 1930. $1.00.
Merritt, A. H.	Periodontal diseases: diagnosis and treatment. New York, Macmillan, 1930. $4.00.
Moorehead, F. B., & Dewey, Kaethe W.	Pathology of the mouth. Philadelphia, Saunders, 1925. $7.00.
Nevin, Mendell, & Puterbaugh, P. G.	Conduction, infiltration and general anesthesia in dentistry. Brooklyn, Dental Items of Interest Pub. Co., 1927. $6.00.
Nichols, I. G.	Prosthetic dentistry: an encyclopedia of full and partial denture prosthesis. St. Louis, Mosby, 1930. $12.50.
Okumura, Tsurukichi	Present status of dentistry in Japan. Tokyo, Japan, Japan Dental Assn., 1931. (Pamphlet.) (No purchase orders accepted.)
Orban, Balint	Dental histology and embryology. Philadelphia, Blakiston, 1929. $5.00.
Osgood, H. A.	Teeth and jaws roentgenologically considered. Annals of roentgenology, volume 5. New York, Hoeber, 1929. $10.00.
Ottolengui, Rodrigues	Table talks on dentistry. Brooklyn, Dental Items of Interest Pub. Co., 1928. $7.00.
Perry, Maude A.	Dietetics and nutrition. St. Louis, Mosby, 1930. $2.50.
Pollia, J. A.	Fundamental principles of alveolo-dental radiology. Brooklyn, Dental Items of Interest Pub. Co., 1930. $8.00.
Posner, J. J.	Minor oral surgery simplified. Philadelphia, Patterson & White, 1928. $2.00.
Prinz, Hermann	Dental formulary. Philadelphia, Lea & Febiger, 1930. $3.50.
Prinz, Hermann	Dental materia medica and therapeutics. St. Louis, Mosby, 1926. $7.50.
Prinz, Hermann	Diseases of soft structures of teeth. Philadelphia, Lea & Febiger, 1928. $6.50.
Raper, H. R.	Clinical preventive dentistry. Rochester, N. Y., Ritter Dental Mfg. Co., 1926. $3.50.
Rapp, F. W.	Elements of anatomical articulation or the mathematics of dental prosthetics. London, Bale, 1930. $2.00.
Roberts, Lydia J.	Nutrition work with children. Chicago, University of Chicago Press, 1927. $3.50.
Rose, Mary S.	Foundations of nutrition. New York, Macmillan, 1927. $2.75.
Schroff, Joseph	Fundamentals of pathology. New York, W. A. Broder, 1929. $2.50.
Sears, V. H.	Full denture procedure. New York, Macmillan, 1929. $2.00.
Shaw, D. M.	Dental prosthetic mechanics. London, Arnold, 1927. $7.50.
Sherman, H. C.	Vitamins. New York, Chemical Catalogue Co., Inc., 1931. $6.00.

Sicher, Harry, & Tandler, Julius	Anatomie für Zahnärzte. Vienna, Julius Springer, 1928. (No purchase orders accepted.)
Silverman, S. L.	Principles and practice of oral surgery. Philadelphia, Blakiston, 1926. $6.00.
Simon, P. W.	Fundamental principles of systematic diagnosis of dental anomalies. Boston, Stratford, 1926. $5.00.
Simon, W., & Base, Daniel	Manual of chemistry. Philadelphia, Lea & Febiger, 1927. $5.00.
Simpson, C. O.	Technic of oral radiography. St. Louis, Mosby, 1928. $5.00.
Smith, G. F. R.	Dental anesthesia. Outlines of dental science. Vol. 1. Edinburgh, Livingstone, 1926. $2.50.
Sorrin, Sidney, & Miller, S. C.	Practice of periodontia. New York, Macmillan, 1928. $3.50.
Steadman, F. St. J.	Pyorrhea alveolaris. St. Louis, Mosby, 1927. $9.25.
Stieglitz, Julius	Chemistry in medicine. New York, Chemical Foundation, 1928. $2.00.
Stillson, W. C.	Dental anatomy: classroom and laboratory quiz compend with supplementary notes. Philadelphia, Saunders, 1929. $2.25.
Stoloff, C. I.	Your teeth. New York, Dutton, 1929. $2.50.
Suter, A. B. W.	Dentistry—a profession and a business. Rochester, N. Y., Ritter Dental Mfg. Co., 1930, $7.50.
Tanguy, T. V.	Science and practice of actinotherapy. St. Louis, Mosby, 1928. $3.00.
Toverud, K. U., & Toverud, Guttorm	Studies on the mineral metabolism during pregnancy and lactation and its bearing on the disposition to rickets and dental caries. Uppsala, Almqvist & Wiksells Boktryckeri-A-B, 1931. (Pamphlet.) (No purchase orders accepted.)
Turner, C. R., & Anthony, L. P.	American textbook of prosthetic dentistry. Philadelphia, Lea & Febiger, 1928. $10.00.
Tyree, C.	Dental health in the prevention of disease. London, Kentucky, Author, 1927. $2.75.
Wallace, J. S.	Physiology of oral hygiene and recent research. London, Bailliere, Tindall & Cox, 1929. $4.00.
Wallace, J. S.	Teeth and health. London, Faber & Gwyer, 1926. $1.00.
Wallace, J. S.	Variations in the form of the jaws, with special reference to their etiology and their relation to the occlusion of the dental arches. New York, Wood, 1926. $6.00.
Ward, L.	American textbook of operative dentistry. Philadelphia, Lea & Febiger, 1926. $10.00.
Weinberger, B. W.	Orthodontics: an historical review of its origin and evolution. 2 vols. St. Louis, Mosby, 1926. $25.00.
Winter, G. B.	Principles of exodontia, as applied to the impacted mandibular third molar. St. Louis, American Medical Book Co., 1926. $15.00.
Winter, Leo	Textbook of exodontia. St. Louis, Mosby, 1927. $10.00.
Woodbury, C. E.	Making and filling of cavities in the proximal surface of the front teeth with gold foil. Omaha, Neb., Author, 1929. $5.00.
Zemsky, J. L.	Oral diseases: practical treatise offering diagnostic and therapeutic aid to the practitioner of medicine and dentistry. Brooklyn, N. Y., Physicians and Surgeons Book Co., 1930. $8.00.
Zemsky, J. L.	Outline of oral surgery. Brooklyn, N. Y., Physicians and Surgeons Book Co., 1930. $4.50.
Zoethout, W. D.	Textbook of physiology. St. Louis, Mosby, 1928. $4.50.

In response to requests, a list of the dental journals in English which are being received by the Library Bureau in 1931, has been compiled. This list includes sixty-two magazines about twenty-five of which are state, county or city bulletins. Such information as could be ascertained regarding price, publisher and frequency of issue is given. Additional information or corrections will be welcomed. The list may be obtained by sending four cents ($.04) to the Library Bureau to cover cost of postage.

Much interest has been aroused recently in the book by Maurice William, D.D.S., entitled "Social interpretation of history; a refutation of the marxian economic interpretation of history." The Library Bureau is pleased to announce that it has a copy of this book available for circulation under the same conditions which govern the circulation of dental books. Purchase orders for the book will also be accepted. The price is $3.15 by mail.

Permission has been received from the U. S. Department of the Interior, Office of Education, to copy and distribute Circular No. 33 entitled "Dentistry." This circular discusses dentistry as a career and has information on compensation, census figures, progress in dentistry, the Dental Educational Council of America, state requirements for dentists, state board examinations, the dental schools, time required for training, courses of study, degrees, expenses, with estimated student budget, and tabulation of dental schools (1931), giving rating, required years, annual expense, enrollments (1928), graduates (1928) and percentages of failures on state board examinations (1928 and period of 1910-1928). This circular will be sent to those interested on receipt of six cents ($.06) to cover cost of postage.

In the June, 1931, issue of THE JOURNAL, a list of the package libraries which have been compiled was published. Regulations regarding the borrowing of these packages are stated at the bottom of the first page of the list.

Steamboat on the Mississippi.

OFFICERS AND TRUSTEES OF THE AMERICAN DENTAL ASSOCIATION

1930-1931

PRESIDENT

Robert Todd Oliver.....210 S. 39th St., Philadelphia, Pa.

PRESIDENT ELECT

Martin Dewey.....17 Park Ave., New York City

VICE PRESIDENTS

Max Giesecke .....Republic Bldg., Denver, Colo.
Rush P. Abbott.....West Point, Miss.
Ernest W. Elmen.....608 Sioux Falls Nat'l Bank Bldg., Sioux Falls, S. D.

SECRETARY

Harry B. Pinney.....212 E. Superior St., Chicago, Ill.

TREASURER

R. H. Volland.....Iowa City, Iowa

BOARD OF TRUSTEES

Robert Todd Oliver, President, Ex-Officio.....210 S. 39th St., Philadelphia, Pa.
Martin Dewey, President Elect, Ex-Officio.....17 Park Ave., New York City
Harry B. Pinney, Secretary, Ex-Officio.....212 E. Superior St., Chicago, Ill.
R. H. Volland, Treasurer, Ex-Officio.....First Nat. Bank Bldg., Iowa City, Iowa
Edward H. Bruening, '33.....620 City National Bank Bldg., Omaha, Nebr.
Harvey J. Burkhart, '33.....Box 35, East Avenue P. O., Rochester, N. Y.
W. O. Talbot, '33.....Medical Arts Bldg., Fort Worth, Texas
Arthur Cornelius Wherry, '33....910 Deseret Bank Bldg., Salt Lake City, Utah
James A. Brady, '32.....2108 N. Broad St., Philadelphia, Pa.
Sheppard W. Foster, '32.....849 Peachtree St., Atlanta, Ga.
Frederick H. Lum, Jr., '32.....151 Main St., Chatham, N. J.
C. N. Johnson, '32.....212 E. Superior St., Chicago, Ill.
J. J. Wright, '32.....1218 Wells Bldg., Milwaukee, Wis.
C. E. Rudolph, '31.....905 Metropolitan Bank Bldg., Minneapolis, Minn.
John F. Stephan, '31.....1034 Keith Bldg., Cleveland, Ohio
Frank T. Taylor, '31.....419 Boylston St., Boston, Mass.
George B. Winter, '31.....Frisco Bldg., St. Louis, Mo.